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A PROGRESS REPORT
TO
DEPARTMENT OF PUBLIC WORKS
ON A
SOUTHERN CROSSING
OF
SAN FRANCISCO BAY

December 1954

Division of San Francisco Bay Toll Crossings
Department of Public Works
State of California

STATE OF CALIFORNIA

Goodwin J. Knight
Governor

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Division of San Francisco Bay Toll Crossings
2054 UNIVERSITY AVENUE
BERKELEY 4, CALIFORNIA

December 1, 1954

PLEASE REFER
TO FILE NO.

Honorable Frank B. Durkee
Director of Public Works
Sacramento, California

Dear Sir:

In compliance with the instructions of your directive of April 1, 1954, and in accordance with this Division's memorandum of April 13, 1954, outlining the various phases of work to be accomplished, we are making an engineering investigation of an additional bridge or other highway crossing across San Francisco Bay. Funds in the amount of $1,500,000 for this study have been made available through the sale of $3,000,000, 1951 Refunding and Improvement Toll Bridge Revenue Bonds, Series D, San Francisco-Oakland Bay Bridge.

This structure, designated in Article 2, Chapter 2, Division 17 of the Streets and Highways Code (as contained in Chapter 1056, Statutes of 1953), as the "Southern Crossing", has its westerly terminus in the vicinity of Third and Army Streets in the City and County of San Francisco and its easterly terminus on Bay Farm Island in Alameda County. Freeway connections from the bridge termini are to be made to the Bayshore and Eastshore Freeways on both sides of the Bay.

It is my pleasure to submit herewith our progress report of the work accomplished to date on this project.

Respectfully submitted,

NCRaab

N. C. RAAB
Projects Engineer and
Chief of Division

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PART I

INTRODUCTION

SCOPE

This report covers the progress to December 1, 1954, on the engineering investigations of that particular crossing of the San Francisco Bay, including the approaches thereto, which is designated as the "Southern Crossing" in Article 2, Chapter 2, Division 17, of the Streets and Highways Code, of the State of California (Chapter 1056, Statutes of 1953). (See Appendix A). This project, shown on Figure I-1, has its westerly terminus in the vicinity of Third and Army Streets in the City and County of San Francisco, and its easterly terminus on Bay Farm Island, City of Alameda, County of Alameda. No consideration has been given to transbay crossings other than the one described in the Statutes, nor to any transbay alignment or type of crossing other than that for which Department of the Army approval has been obtained by the Department of Public Works.

The scope of the studies to date has been limited by time to a consideration of physical features of the proposed crossing. Detailed estimates of cost have not yet been completed; and there has been insufficient time to permit a thorough exploration of all problems relating to potential traffic, probable revenues, tolls required, and other similar matters incidental to financing.

It is the intent of the Division to continue with the studies and investigation of all phases of the Southern Crossing and to prepare a more detailed and comprehensive report to the Department of Public Works by the end of 1955.

HISTORY OF SOUTHERN CROSSING

The concept of a southern crossing of San Francisco Bay, considered in this report as connecting the City and County of San Francisco with Alameda County, is not new. Various locations for such a crossing have been discussed by engineers and laymen for almost a century. Some of those locations reported on by various governmental bodies during the past two decades are shown on Figure I-2.

In the "Report of Board of Engineers, Transbay Bridge, San Francisco," dated May, 1927, a direct crossing between Rincon Hill, San Francisco, and the western end of the Alameda Mole, Alameda, was recommended to the City of San Francisco in preference to other lines studied.

In the "Report of The Hoover-Young San Francisco Bay Bridge Commission," dated August 1930, three of the location studies involved bridges in the general vicinity of that particular Southern Crossing which is the subject of this report.

The recent history of a southern crossing dates from 1941, when a Joint Army-Navy Board was convened, pursuant to H.R. 158, 77th Congress, 1st Session, to investigate the need and feasibility, from the standpoint of national defense, of constructing a bridge between Hunter Point and Bay Farm Island. Two plans were studied, (1) a high-level bridge passing 2000 feet north of Point Avisadero (Hunter Point), and (2) a low-level lift bridge passing 8000 feet south of this Point. Both lines converged at a common terminus on the southwest shore of Bay Farm Island. At that time no substantial reasons could be advanced showing that such a structure was necessary from the standpoint of national defense, and the Board recommended against construction of a bridge in its report dated November 8, 1941.

Following the end of World War II it became evident that increasing vehicular traffic on the San Francisco-Oakland Bay Bridge would soon exceed the practical capacity of that structure. For this reason, two concurrent engineering studies of the possibility of a new crossing were authorized in 1945 and in 1946. One study was undertaken by the State Department of Public Works in response to a request of the California Toll Bridge Authority, and the other was by a new Joint Army-Navy Board (1946) acting in accordance with instructions from the Congress as contained in H.R. 529, 79th Congress, 2nd Session.

The State Department of Public Works' report was released in January 1947. Eleven different crossing locations were studied, of which three can be described as southern crossings. One, a high-level bridge, crossed between Twentieth Street in San Francisco and the extension of Webster Street in Alameda. Another, a low-level bridge with a movable span for navigation, crossed between Candlestick Point and Bay Farm Island. The third, a combined causeway-tube, crossed between Army Street in San Francisco and the extension of Webster Street in Alameda.

The report of the Joint Army-Navy Board (1946) was also released in January 1947. The Board, after investigating 29 different crossing plans, gave attention to three crossings, one of which was essentially the same causeway-tube southern crossing studied by the Department of Public Works.

The Army-Navy Board in its 1947 Report also studied a bridge between Candlestick Point and Bay Farm Island but concluded that there was insufficient traffic to warrant such a crossing.

The Division of San Francisco Bay Toll Crossings was organized within the State Department of Public Works in December 1947, and was assigned the task of studying in further detail the two particular crossings of San Francisco Bay which had been recommended in the two foregoing reports:

(a) A high-level bridge similar in design to and located parallel to, and northerly of, the existing San Francisco-Oakland Bay Bridge, as recommended by the State Department of Public Works.

(b) A causeway-tube structure between Army Street in San Francisco and the extension of Fifth Street in Alameda, as recommended in the report of the Joint Army-Navy Board (1946).

Immediate construction of the first of the two above crossings was recommended by the Division of San Francisco Bay Toll Crossings in its 1948 Report. The estimated cost of the six-lane southern crossing was $178,421,000.

In a report to the Assembly Fact-Finding Committee on Tideland Reclamation . . . and Relief of Congestion on Transbay Crossings, a board of consulting engineers suggested the possibility of increasing the vehicular traffic capacity of the existing Bay Bridge by certain structural modifications, thereby allegedly obviating the need for a parallel structure, and in conjunction therewith constructing a southern crossing on the line referred to in (b) above. In response to this suggestion, this Division made a detailed study of the southern crossing and the associated proposed changes to the Bay Bridge. The results of this study were contained in a report dated October 1949. Based upon a four-lane roadway as recommended by the consultants to the Committee, the estimated cost of the structure was $154,211,000.

Because of the differences of opinion as to where the next crossing of San Francisco Bay should be built, together with a fundamental disagreement as to the purpose and objective to be served by any new Bay crossing, all work by this Division on the southern crossing and the parallel bridge was suspended on June 30, 1950. All plans and drawings, both complete and incomplete, were placed in storage where they remained in an inactive status until the spring of 1954.

During the 1951 Session of the State Legislature bills were introduced in an effort to settle the question of where the next crossing of San Francisco Bay should be located. All of these bills failed of passage. In the 1953 Session, however, a new attempt proved successful. Chapter 1056, Statutes of 1953, not only gave priority to the Southern Crossing, and stipulated the means of obtaining funds for the engineering studies, plans, and specifications, but it also specified in detail the location of the Crossing and its approaches. The designated termini were (1) the vicinity of Third and Army Streets in San Francisco, and (2) Bay Farm Island.

It should be noted that this particular location had not previously been considered in any official engineering report. All previous reports by the State and other governmental agencies had contemplated that any crossing from Army Street in San Francisco would have an easterly bridgehead on the south shore of the City of Alameda, approximately three miles northeast of the Bay Farm Island terminus.

Procedure Followed in Accordance with 1953 Statutes

The Southern Crossing Bill, officially referred to as Chapter 1056 of the Statutes of 1953, and which constituted an amendment to the California Toll Bridge Authority Act (Division 17, Streets and Highways Code), specifically directed the State Department of Public Works to apply for a Department of the Army permit for construction on the designated line. In accordance with the directive, an application was submitted by the Department on July 2, 1953, and a public hearing was held by the Corps of Engineers, San Francisco District, on August 17, 1953. At this hearing it developed for the first time that the U. S. Navy in connection with its Alameda Naval Air Station had definite plans for extending its seadrome runways to the south, and that the proposed crossing on a direct line between the points designated in the Statutes would interfere with the seadrome expansion. Consequently, the application of the Department of Public Works for a crossing on the direct line between Army Street and Bay Farm Island was denied by the Department of the Army on November 3, 1953.

The question then arose as to whether the Department of Public Works could or should, under the terms of Chapter 1056, broaden its studies to embrace other crossings with termini in San Francisco as far south as Candlestick Point. This question was referred by the Director of Public Works to the Attorney General of the State of California, who rendered a formal opinion (No. 53/259) on December 15, 1953 (22 Ops.Cal.Atty.Gen.213).

This opinion, in brief, required the Department of Public Works to submit a revised application to the Department of the Army for a line swinging several thousand feet south of the proposed tangent crossing, thereby avoiding the restricted seadrome area, but retaining the same termini as defined in the Statutes.

In accordance with this opinion, a revised application calling for a crossing on a line deviated several thousand feet to the south was submitted for the consideration of the Department of the Army on December 31, 1953, and a permit was granted on April 8, 1954. The instrument of approval is reproduced in Appendix B.

The Statutes also specified that the possibility of financing the Southern Crossing through the U. S. Reconstruction Finance Corporation should be explored. The Director of Public Works addressed a letter to the RFC covering this matter, and received a reply indicating this agency would be unable to finance the proposed project.

A directive was issued on April 1, 1954, by the Director of Public Works to the Division of San Francisco Bay Toll

Crossings to initiate the engineering studies for the Southern Crossing. A separate section was organized at once within this Division, and its efforts have been devoted exclusively to the Southern Crossing studies.

Drawings showing general alignment of the Crossing and the approaches have now been completed, and structural design of the main crossing and approaches has been resumed where it was discontinued in 1949.

A drawing and a detailed description of the Southern Crossing and approaches thereto were submitted by the Department of Public Works to the Attorney General of the State of California for his review. In answer, a communication dated August 20, 1954, stated in part that:

> "We believe each of the approaches listed therein conforms in all respects with the requirements of the Legislature as expressed. . ." (in Chapter 1056, Statutes 1953).

A drawing showing the general plan and elevation of the transbay section of the Southern Crossing was submitted to the Corps of Engineers, San Francisco District, for review on July 29, 1954. By letter dated October 20, 1954, the District Engineer advised this Division that the plan was in compliance with the previously issued Department of the Army permit, and that all minimum requirements of the U. S. Navy had been met.

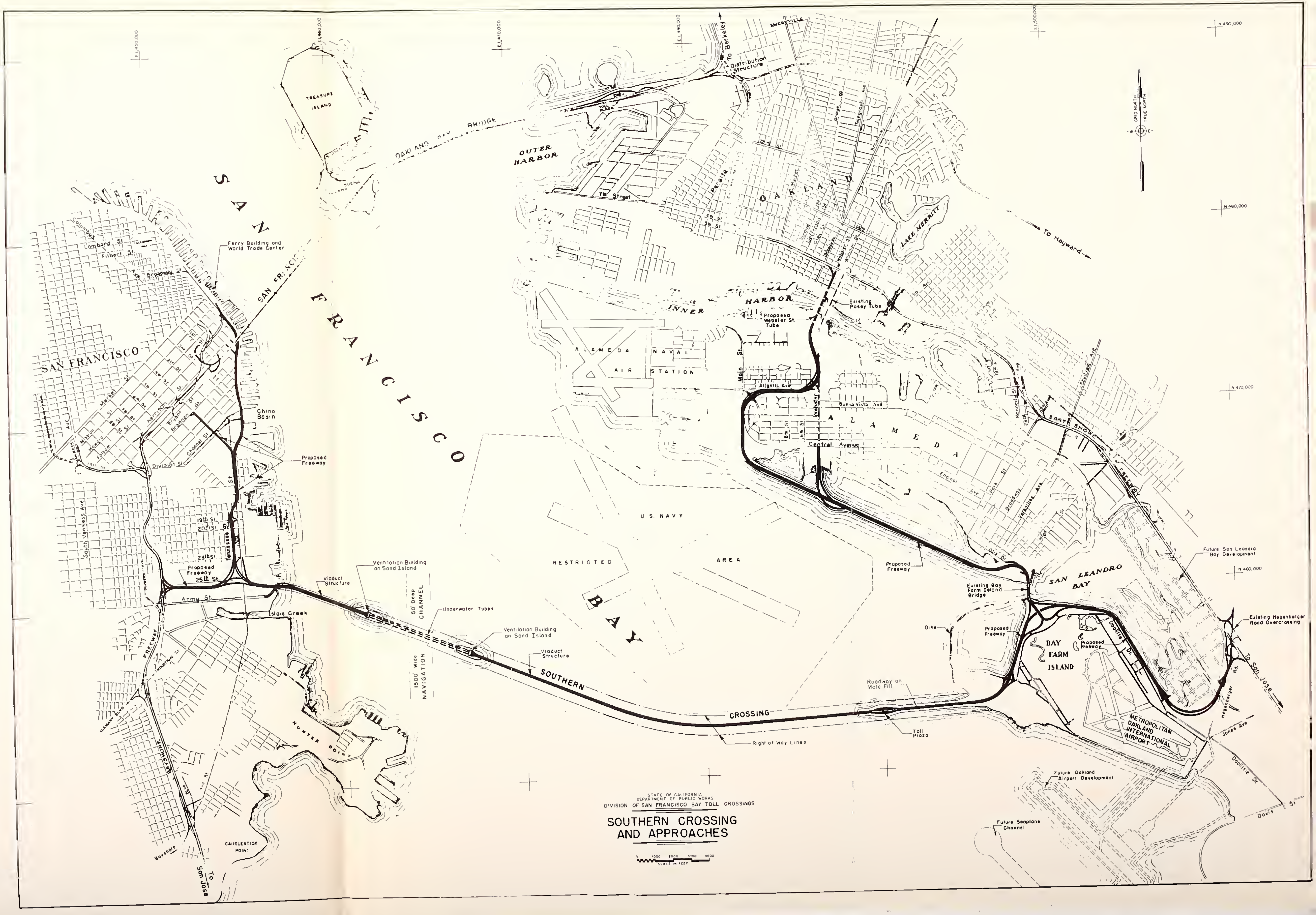
It is on the basis of the above legal opinion and the statement of compliance with Federal requirements that this Division has been proceeding with the studies of the Southern Crossing and its approaches.

Other Current Studies

Two other engineering studies involving problems of transbay transportation are now under way. The first of these is being undertaken by a private consulting firm for the San Francisco Bay Area Rapid Transit Commission, and the second is the salt water barrier study being undertaken by the California Division of Water Resources.

The rapid transit study is being financed through a $400,000 State appropriation (Chapter 1212, Statutes 1953, Approved June 18, 1953), supplemented by a $350,000 contribution from the nine Bay Area counties. The initial phase of the salt water barrier study is being financed from a $250,000 appropriation to the Water Projects Authority, and was authorized by Chapter 1104, Statutes 1953, approved June 11, 1953. This act is officially known as the "Abshire-Kelly Salinity Control Barrier Act of 1953".

FIG. 1-



STATE OF CALIFORNIA
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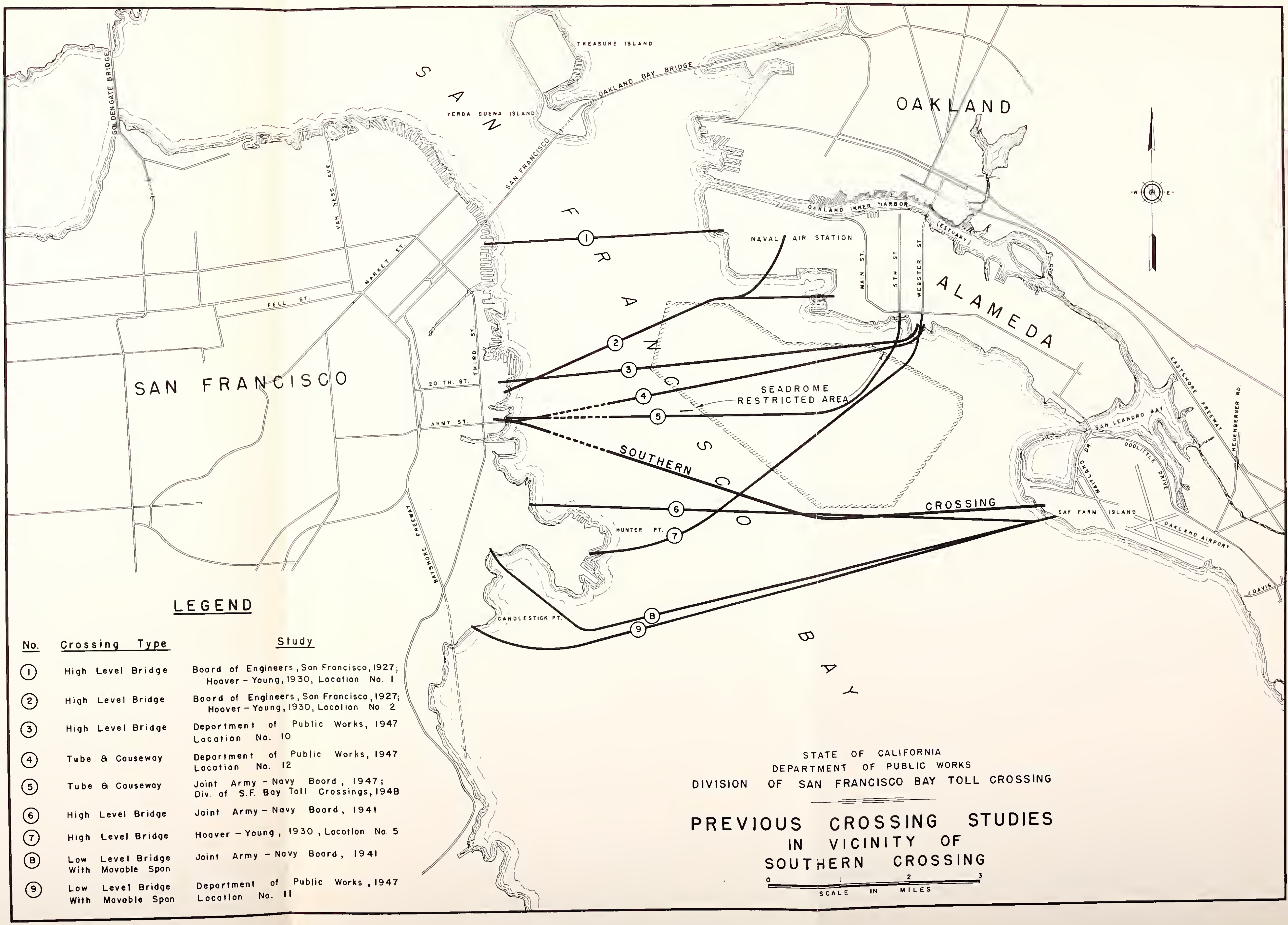
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING AND APPROACHES

FIG. I-2



LEGEND

No.	Crossing Type	Study
①	High Level Bridge	Board of Engineers, San Francisco, 1927; Hoover - Young, 1930, Location No. 1
②	High Level Bridge	Board of Engineers, San Francisco, 1927; Hoover - Young, 1930, Location No. 2
③	High Level Bridge	Department of Public Works, 1947 Location No. 10
④	Tube & Causeway	Department of Public Works, 1947 Location No. 12
⑤	Tube & Causeway	Joint Army - Navy Board, 1947; Div. of S.F. Bay Toll Crossings, 1948
⑥	High Level Bridge	Joint Army - Navy Board, 1941
⑦	High Level Bridge	Hoover - Young, 1930, Location No. 5
⑧	Low Level Bridge With Movable Span	Joint Army - Navy Board, 1941
⑨	Low Level Bridge With Movable Span	Department of Public Works, 1947 Location No. 11

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSING

PREVIOUS CROSSING STUDIES IN VICINITY OF SOUTHERN CROSSING

PART II

TRAFFIC

Introduction

All joint revenues from the Southern Crossing and the Bay Bridge, after deduction of costs of maintenance, operation, and insurance, are to be made available for payment of principal and interest on the Southern Crossing bond issue. Therefore, a study of traffic is of fundamental importance, since it is from traffic that revenues to pay for the Southern Crossing must be derived.

The primary factors to be determined by the traffic study are (1) the present potential traffic demand for a Southern Crossing, (2) the rapidity with which this volume and the overall volume of transbay traffic can be expected to increase in the future, (3) the pattern and directional nature of traffic on the Southern Crossing throughout the day, (4) the extent to which the construction of a new transbay crossing will stimulate new traffic, (5) the relationship of the roadway capacity to the estimated traffic demand, and (6) the degree to which the Southern Crossing will relieve congestion on the Bay Bridge. Thus an accurate estimate is required of total transbay traffic and the percentage which can be expected to use each of the crossings. The basic objectives of the traffic study are (1) to furnish data for the design of a Southern Crossing and approaches with adequate roadway capacity, and (2) to assist in ascertaining the maximum practical bonding capacity of the project.

Numerous sources of information relating to traffic are now available, and various analyses of these data are contained in previous reports. These are listed in Appendix D.

In connection with the salt water barrier study now in progress, as described in Part I of this report, an analysis of transbay traffic was made by the Division of Water Resources. Estimates were made of probable diversion from the Bay Bridge to the proposed Southern Crossing and to certain proposed barrier sites in the southern arm of the Bay. However, these traffic estimates had not been officially released at the time of this writing.

To obtain a more detailed analysis of traffic as well as an estimate of earning capacity and other matters relating to financing, an independent traffic consultant will be engaged by this Division, as is described in more detail in Part VII of this report. It should be emphasized that the financial study to be undertaken by the private consulting firm on behalf of this Division must be predicated on the total volume of transbay traffic using both the Southern Crossing and the Bay Bridge.

Recent Traffic Trends

Figures II-1 and II-2 show some of the interesting aspects of traffic across the various bridges in the Bay Area.

Of particular significance is the fact that, although transbay vehicular traffic is steadily increasing on the various bridges (see Figure II-1), the total passenger crossings of the Bay (see Figure II-2) declined rapidly at the end of World War II, and then leveled off to a relatively constant figure for the past eight years. The pronounced increase in use of private automobiles has failed to offset the sharp decline in transbay transit riding, and as a consequence there is a net loss in the number of persons per year crossing the Bay. Although the number of people riding across the Bay in automobiles has increased from about 46 million in 1947 to about 55 million in 1954, mass transit patronage has dropped from 29 million to around 15 million. (The figures for transit travel omit Key System rail passengers to and from Yerba Buena Island.)

The traffic statistics also indicate that the annual number of transbay trips per year, considering either the average Bay Area resident or the average Bay Area automobile, has been falling off steadily in recent years. It appears a sizable decline of transbay travel has been prevented only by the phenomenal growth of the area. It is not clear whether the failure of transbay travel to keep abreast of population and motor vehicle registration increases has been caused primarily by deteriorating transportation conditions, or whether other factors not related to transportation have played a predominant role. In any event, the decline of transbay travel which has now become apparent is a unique phenomenon and warrants careful analysis. But until additional traffic information becomes available from the studies now being made by the Rapid Transit Commission and until the detailed traffic study and analysis is undertaken for this Division, it will not be possible to predict whether future transbay travel will remain relatively stable, whether future growth can be expected, or whether losses may occur. In any event, in estimating the probable usage of new transbay crossings, there is no basis for assuming that transbay travel will be directly related to increasing population and increasing motor vehicle usage.

Problem of the Bridge Railway

It will be very difficult if not impossible to make accurate estimates of probable diversion of peak hour traffic from the Bay Bridge to the Southern Crossing until some decision is reached with regard to the future status of the Bridge Railway and use of the space occupied by it on the Bay Bridge.

Financial Implications of Traffic Data

Because the Bay Bridge and the Southern Crossing are to be included in the same financial "package," and because the Bay Bridge will undoubtedly carry the bulk of all transbay traffic, wide errors in estimating Southern Crossing traffic will have a relatively small effect on the estimates of combined earning capacity. Therefore, the total bonding capacity will be influenced only to a minor extent by the actual amount of traffic induced or generated by the Southern Crossing, and even to a lesser extent by diversion from the Bay Bridge.

Capacity of Approach Freeways

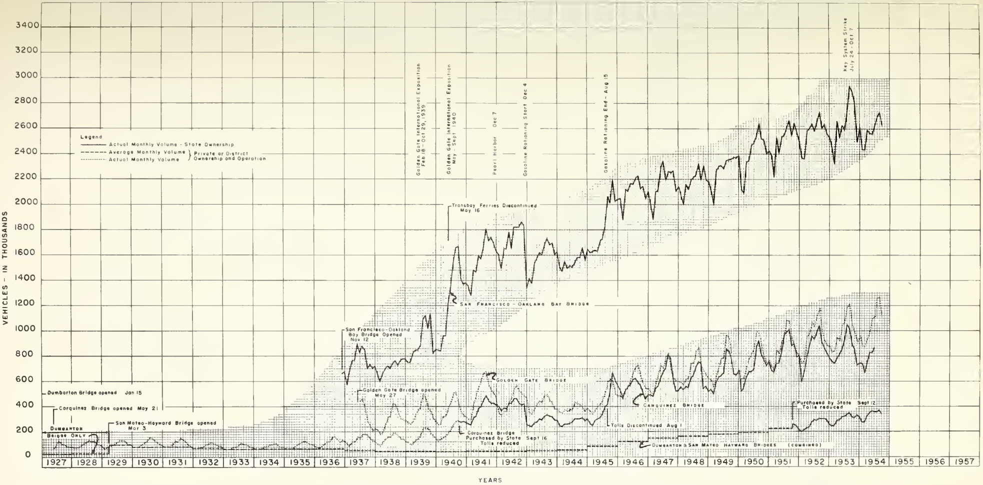
To assist in determining the number of lanes to provide on the various approach freeways leading to the Southern Crossing, the study prepared by the Division of Highways entitled "Traffic Report, San Francisco Metropolitan Area," dated June 1949, has been reviewed. This report indicates the probable relative usage of the various approach freeways by traffic from the southern crossing contemplated in 1948, and in addition shows the approximate volumes of local or internal traffic that would use these freeways. From this report the following determination has been made of the desirable lane capacity on each component of the San Francisco approach system:

Army Freeway	Four lanes
Embarcadero Freeway, south of Fourth Street Connection	Six lanes
Embarcadero Freeway, between Fourth Street Connection and Howard Street	Four lanes
Fourth Street Connection	Four lanes

The Division of Highways' 1949 Report did not contemplate the possibility of the Southern Crossing terminating on Bay Farm Island. Therefore, the information presented is not directly applicable to the problem of estimating relative traffic usage of the various approaches on the east side of the Bay. Some information of this nature is now being developed by the study being undertaken by the Division of Water Resources, and the latter has been used as a guide in determining the number of lanes to provide on the East Bay approach system.

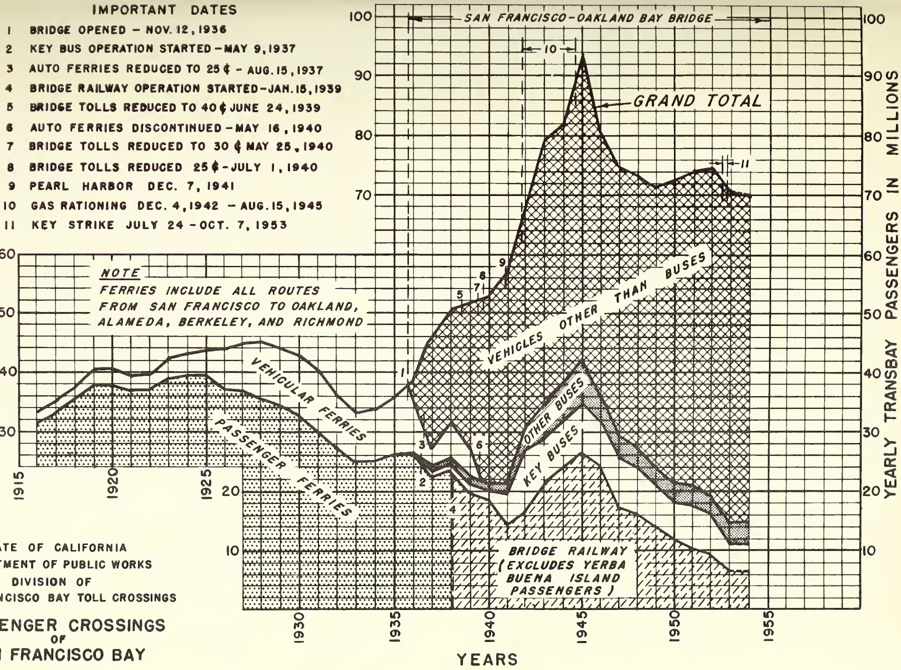
It is planned that the traffic consultants to be engaged by this Division will investigate the matter of relative traffic usage of the various approach freeways by both local and transbay traffic. From this study a determination can be made as to whether the preliminary lane capacity provided on the various approach freeways is adequate to serve the probable traffic demand.

FIG. II-1



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

TOTAL MONTHLY VEHICULAR TRAFFIC
BAY AREA BRIDGES



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF
SAN FRANCISCO BAY TOLL CROSSINGS

PASSENGER CROSSINGS
OF
SAN FRANCISCO BAY

FIG. II-2

PART III

FOUNDATIONS

Over a period of years numerous foundation explorations in the southern portion of the Bay have been made by various agencies. These explorations have disclosed the general character of the underlying foundation materials between San Francisco and Bay Farm Island. Since the general nature of the foundation conditions was known, it was considered unnecessary to undertake new detailed foundation explorations for the preliminary engineering studies. However, it is contemplated that borings to determine more precise information will be made prior to construction.

The previous borings which are now available for the transbay section, and which have been used in the studies to date, include those made by the Division of San Francisco Bay Toll Crossings in 1948 on the then proposed Southern Crossing line between Army Street and Alameda, borings made in connection with the Hoover-Young Report of 1930, borings made by the State Department of Public Works in 1946 for the preliminary studies of an additional crossing of San Francisco Bay, and borings made in this vicinity by various other agencies.

The general foundation conditions on the overwater crossing are described briefly as follows:

The surface layer of mud, a recently deposited sediment, is from 20 to 60 feet thick. It has been described as a soft, compressible, and unstable mass. Underlying the soft mud are alternating layers of clay and sand and intermixtures of both, which become progressively stronger and more stable with increased depth. At the locations where the proposed sand islands would be built, the water is from 40 to 60 feet deep. The zone of soft, unstable, silty material of high moisture content extends to a depth of about 125 feet below sea level. It would consolidate greatly under direct load and in addition would be displaced by any additional fill placed above it. This soft muck must be removed and replaced with something more stable to support the tube section and the transition sections of the Southern Crossing.

At no place along the transbay alignment can bedrock be reached within a reasonable depth; however, other suitable bearing strata are encountered.

Since the Southern Crossing is not located in a cable or utility area, no telephone, telegraph, or power lines on the bottom of the Bay would have to be moved.

On the San Francisco side of the Bay similar types of foundation data were already at hand. These included borings made by the State Division of Highways; for the original construction of the San Francisco-Oakland Bay Bridge; by the Western Pacific Railroad; by the State Board of Harbor Commissioners; and borings reported by the American Society of Civil Engineers, San Francisco Section, Subsoil Committee, in its 1932 report.

The major approach structures on the San Francisco side, i.e., the proposed bridges across China Basin and Channel Street (the waterway extending inland from China Basin), the elevated viaduct along The Embarcadero, and the Third and Army Street interchange, will be constructed on filled land in what was once part of San Francisco Bay. The nature of this fill is unknown but is suspected to consist of mud, old ship hulks, and general assorted debris. Foundations for highway structures must be carried down through this fill to suitable bearing material.

The foundation conditions for the Webster Street Tube were explored in the early 1940's when the structure was first designed as a proposed Naval Access project. Foundation explorations and construction records were also available for the nearby Posey Tube. Additional borings were made by this Division in 1948. A discussion of the results of the borings and a diagram summarizing the foundation conditions for the Webster Street Tube will be found in the 1948 Report of this Division on "Additional Toll Crossings of San Francisco Bay."

Information regarding foundation conditions along other sections of the proposed East Bay approach system is available, although in less detail than for the Webster Street Tube. However, no major structures are located in this area and no unusual foundation problems are anticipated for the various roadway embankments and highway separation structures. Sources of foundation information in this area include the explorations of the State Division of Highways along the Eastshore Freeway and at the Bay Farm Island Bridge.

Source of Sand for Hydraulic Fill

The total quanity of sand required as hydraulic fill for the Southern Crossing and approaches is tentatively estimated at about 15 million cubic yards.

When the original studies for the proposed Army Street-Alameda tube-causeway crossing were made in 1948 it was contemplated that the material required for the sand islands, the mole approach section, and for support of the tube would be obtained from sand deposits located near the west end of Bay Farm Island. In recent years proposals have been advanced that portions of this material be used for fill for land development along the Bay Farm Island and Alameda shores. The Port of Oakland is also interested in securing a portion of this material for use in the extension of the Oakland Airport.

Sand for the mole fill and the toll plaza will be obtained from within the 1000 foot right of way to be reserved for the Southern Crossing.

The 11 million cubic yards of material to be used for the sand islands on which are to be constructed the ventilation buildings and approaches to the tubes, together with the three million cubic yards of material to be used for freeways on the east side of the Bay, will be obtained from two different sources. Since a considerable amount of undesirable material must be disposed of in connection with the construction of the sand islands, and because previously contemplated disposal areas in the vicinity of Islais Creek are now unavailable, the problem of sand acquisition has been coordinated with that of disposal of unsuitable material. A less expensive method of disposing of the undesired material and filling with sand has been found.

PART IV

TRANSBAY SECTION

INTRODUCTION

Chapter 1056 of the Statutes of 1953 provided funds to bring the surveys and plans for the Southern Crossing to the "same state of completion" as those heretofore made for the parallel bridge. This has been interpreted to require that the work shall be confined to those same surveys, plans, and studies, with alignment revised as necessary, which were started by this Division in 1948 and for which Department of the Army approval was granted on April 8, 1954. No type of structure other than the one for which an Army permit was obtained in compliance with Chapter 1056 is being studied.

The basic criteria for design of the Southern Crossing tube-causeway are as follows:

1. Freeway standards are to be used, with maximum grades limited to 3-1/2%.
2. Six roadway lanes, each 12 feet wide, are to be provided.
3. A navigation channel, providing for a minimum vertical clearance below mean lower low water (M.L.L.W.) of 50 feet, and a horizontal clearance of 1500 feet, normal to the channel, is to be provided. No part of the structure is to be higher than 40 feet above M.L.L.W. on the southeast approach glide path to the Alameda Naval Air Station seadrome.
4. A channel providing a vertical clearance of 15 feet above mean higher high water (M.H.H.W.) is to be provided under the east approach trestle for use of Alameda Naval Air Station crash boats.

The general plan and elevation of the transbay section are shown on Figure IV-1.

The problem is to plan a vehicular crossing of the waters of San Francisco Bay between the points specified by the Legislature of the State of California -- a crossing that can be supported by the rather unfavorable foundation materials available in this location, that will provide adequate clearances for the passage of shipping, that will not interfere with operations of the Alameda Naval Air Station or the Metropolitan Oakland International Airport, and a crossing that will provide maximum relief of congestion on the Bay Bridge. These are the controls that govern the alignment and design of the structure.

DESCRIPTION OF MAIN CROSSING

For purposes of design, the transbay section of the Southern Crossing has been defined as extending from Station 172+70 on the San Francisco side of the Bay, which point is about 500 feet west of the present shoreline, to Station 580+00 on the Bay Farm Island shore. The total length between these points is 40,730 feet, or 7.71 miles. This length is divided into the several components shown in the tabulation on the opposite page.

The transbay section as planned in this report will be a six-lane freeway, with two three-lane roadways on the mole and viaduct and two-lane roadways in each of the three tubes under the navigation channel. The reasons for the Division's decision to plan for six lanes are as follows:

1. It would be difficult, hazardous, and costly to add lanes to the crossing at a later date. This would be particularly true of the underwater tubes.

2. Approach facilities on either side of the Bay would feed eight lanes of traffic onto the crossing.

3. The three two-lane tubes would facilitate flexibility of operation. For instance, two tubes could be assigned to carry unbalanced traffic in the peak direction during rush hours; one tube could be shut down during off-peak hours to allow maintenance and to save on lighting and ventilation.

Components of Transbay Section

Item	Station	Length
West Viaduct Structure	172+70 to 225+58	5,288
Transition Section on West Sand Island	to 233+71	813
Ventilation Building on Sand Island	to 234+46	75
Bay Tube	to 292+54	5,808
Ventilation Building on East Sand Island	to 293+29	75
Transition Section on Sand Island	to 301+42	813
East Viaduct Structure	to 519+98	21,856
Mole Fill (including Toll Plaza)	to 580+00	6,002

Total length (feet) 40,730

" " (miles). 7.71

Main Channel Section

A general plan for the Bay tubes crossing under the navigation channel is shown on Figure IV-2. Basically, this section of the transbay crossing consists of two large artificial sand islands, one on each side of the main shipping channel, and connecting these islands three subaqueous tubes each of which will carry two traffic lanes. The tubes will pass under the channel providing a minimum of 50 feet clear depth of water for a distance of 1500 feet. Vehicles will reach the islands from the San Francisco shore via a low trestle viaduct, and from Bay Farm Island over first a mole causeway and thence a low trestle viaduct.

Building the large islands in the relatively soft Bay bottom mud presents a formidable problem which is greatly complicated because settlements after construction must be minimized. If these settlements are large, the tubes may be subject to serious damage or destruction. The development of an assured solution to this problem was given much time and effort by the staff of the Division and the Board of Consultants in 1948. The plan outlined below was adopted after all other acceptable proposals were found to be less satisfactory.

The first step will be to dredge a trench in the Bay mud in which to place the sand fill and tubes. This trench will be approximately 7,700 feet in length, 60 to 70 feet deep measured from the mud surface, and will vary in bottom width from 140 to 350 feet. Side slopes will be four horizontal to one vertical. In places, excavation will reach a depth of 120 feet below sea level, which is near the limit that can be reached by a hydraulic dredge with the ladder extended. A typical cross-section of the trench is shown as Figure IV-3 and a profile taken along the center line of the crossing as Figure IV-4.

Exhaustive studies of the boring data were made in 1948 to establish the dimensions of the trench. Its depth will be sufficient to remove the unstable upper layers of softer material. Bottom widths of the trench will be sufficient to distribute and carry the heavy vertical load of the sand island to the trench bottom without exerting horizontal pressure on the soft mud sufficient to cause the latter to fail by displacement. Such failure would be transmitted to the sand island.

Laboratory analysis of the 1948 boring samples indicated that a four-to-one ratio represents the steepest slope at which the trench sides will stand at the depths required and not slough into the trench. This slope is controlled by the strength of the soft mud and its ability to stand up without support before the trench is backfilled with sand.

Silting up of the subaqueous excavation before the sand is placed is not expected to be a serious problem. Studies made available to the Division in 1948 indicated that the trench will fill at the rate of approximately 0.4 feet per year.

Areas suitable for disposal of the material excavated from the trench will be designated by the Corps of Engineers,

U. S. Army. Sand to fill the trench and build the embankment is available in various locations in San Francisco Bay.

As soon as a portion of the trench is excavated in the Bay bottom, the sand fill will be placed. As early as possible the sand islands will be built to their full height, which in places is as much as 130 feet above the bottom of the trench. This procedure will produce the maximum initial settlement in the shortest reasonable time. During this stage of construction the fill in the trench near the center of the channel will be carried only to the elevation of the bottom of the tube sections. In this location, the ultimate additional load on the bottom of the trench is not great, and consolidation is not a serious problem.

Below the mud line there will be no difficulty in confining the sand as it is deposited in place. Above the Bay bottom, however, confining embankments must be placed around the areas to be filled to prevent the sand from flowing away. These embankments will be built of quarry waste rock and placed in 5-foot lifts. (See Figure IV-3.) Careful placement will be accomplished below the water level by discharging the material from buckets or pipes.

The previous studies indicated that a total additional settlement of one foot after the tubes are in place will not cause damage to the tubes providing this settlement is fairly uniform. Greater subsidence than one foot or an abrupt change in the amount of settlement over a short length might cause serious damage. Analysis of samples obtained by the test borings on the line studied in 1948 indicated that the total settlement in the materials underlying the deep sand fills would be approximately 2.5 feet. The rate and amount of this settlement will be much greater during the first few years than in the years to follow. It was determined that probably within 18 months and assuredly within two years all but one foot of the total settlement will have taken place. When this has been accomplished the tubes can be built.

Placing the Tubes

The subaqueous tubes will consist of cylindrical precast reinforced concrete sections which will be constructed in a drydock. After the open ends have been bulkheaded, these sections will be towed to the site, sunk into the previously excavated trench, and covered with sand backfill. Special supports and connections to secure proper alignment and watertightness are required. The portals of the tubes will rest upon the specially constructed sand islands previously described.

This method of construction was selected by the Division in 1948 after consideration of methods used to construct tubes in other localities.

Altogether, ten subaqueous tubes have been constructed in this country by the method described above, including two recent ones beneath the Houston Ship Channel in Texas and one tube beneath the Elizabeth River at Norfolk, Virginia. In California, the Posey Tube beneath the Oakland Estuary was built in this manner, and the proposed new Webster Street tube parallel to the Posey Tube is designed to use the same procedure. Additional tubes to be built by this method are now under construction or are proposed in various localities.

After sufficient consolidation of the sand islands has been accomplished, a trench will be dredged through them to a depth sufficient to permit placing the precast tube sections. This sand will not be wasted as it will be used to cover the tube sections under the main channel.

The placing of the tube sections is normally started at one end, and the sinking of successive sections extends the tube across the channel. Thus, access to the tube interior is gained from the end at which work is initiated. When a new section is placed and connection made to the previously placed unit, the temporary bulkheads between the last two sections are removed. The bulkhead at the outer end of the last section remains in place until another section is added. In this manner, work on the interior of the tube, including complete finishing of the joints, can proceed close behind actual tube placing operations.

The order of work will be so arranged that construction time is held to a minimum. Dredging of the mud and placing of the sand fill will begin at one portal and proceed toward the other. Consolidation can be completed and tube placing begun at this end while settlement is still taking place under the more recently placed sand. Simultaneously, tube sections will be cast and prepared for placing.

The tubes for this crossing will be reinforced concrete sections each 200.25 feet in length which can be cast in local drydocks. They will be cylindrical in cross section, with an outside diameter of 37 feet, an inside diameter of 32 feet, and a wall thickness of 2 feet-6 inches. (See Figure IV-5.) Roadway slabs will be poured as an integral part of the tubes, but the remaining interior features will be added after the sections are in place. Each section will weigh 5,253 tons gross, as cast.

Before a tube section leaves the drydock, its ends will be bulkheaded to make it watertight, the vents from the fresh air duct to the roadway section sealed, and the fresh air duct filled with water. The sinking method will be optional with the contractor. Consequently, the procedure described below is a suggested method only.

The roadway slab would be covered with sand and sprayed with water by means of a sprinkler pipe installed in the top of the tube. In this condition the sections would float right side up and with very little freeboard. When the tube is in position for sinking just enough water would be pumped through the sprinkler system onto the sand to cause the tube to sink. By this means the extremely heavy sections could be handled with ordinary floating equipment. This method would tend to prevent one end sinking before the other because of unbalanced loading or a shifting of weight.

The sequence of operations for placing the tubes is shown in Figure IV-6. All underwater operations are to be performed from floating equipment. First, a group of short timber piles will be driven into the sand bed directly under the location of each joint in the tubes. In general these piles will not penetrate through the sand fill. They will then be cut off at a predetermined elevation. These piles will support and secure in place precast slabs of reinforced concrete into which have been cast shoes for temporarily supporting and aligning the tube sections.

The manner of transporting the precast slabs to the site and lowering them in place is another procedure which probably will be optional to the contractor. One suggested method is to float the slabs to the site with buoyancy provided by steel pontoons fastened temporarily to the slabs' upper faces. On the site, sufficient water would be added to the tanks to cause the assembly to sink, and placement could be controlled by cranes mounted on barges. After the slabs are in place and carefully aligned, the steel pontoons would be disconnected and made available for re-use.

Tube sections will be lowered into place individually beginning at one end of the crossing. The connecting devices between tube sections and the special shoes on the support slabs are so designed that as each section is lowered it will be forced against the one already in place and held in exactly the right position. The face of one section will carry a special rubber seal which will be forced against a seat on the face of the adjacent section. Thus, when both sections are in place, the connection between them will be relatively watertight. The space between the rubber seal and the outer limits of the joint will be filled with tremie concrete.

As the tube sections are placed and connected, the dredged trench will be filled with sand placed under, around, and on top of the tube. The tubes will be covered with a minimum thickness of five feet of sand which will supply additional weight to hold the sections in place. On either side of the navigable channel, where the top of the tube shell is less than 50 feet under the water surface, protection against the hazard of collision by ships is provided by (1) a minimum cover thickness over the tubes of ten feet, the top three feet of which is heavy riprap, (2) a minimum horizontal thickness of fill beyond the outside of the tube section of 40 feet, (3) a line of navigation lights mounted on pile dolphins 250 feet on either side of the center line to serve as a visual warning to ships, and (4) audible warning devices in the main channel. All faces of the sand fill that lie above the bottom of the Bay will be finished with rock embankment to prevent loss by wash or wave action. (See Figure IV-3.) Support for the tubes will be furnished by the sand bed. The piles upon which the precast support slabs rest will be designed so that they will settle when the sand backfill is placed, thus transferring the tube load to the sand bed.

Following the tube placing and covering operations, crews working inside the tube will proceed from the sand island and remove the temporary bulkheads at each joint. As each set of bulkheads is removed, the inside of the joint can be completed. The recess inside the rubber seal (Figure IV-5) will be filled with reinforced concrete which will insure watertightness and produce a joint of the same strength as the remainder of the tube. To complete the tubes, the ceilings, pavement, lights, signals, and other interior finish will be placed.

Ventilation

Ventilation for all tubes will be provided by pumping fresh air from the two ventilation buildings into the duct under the roadway. (See Figure IV-5.) It will reach the traveled way through ports which discharge slightly above the curb line. Used air containing the waste gases from motor vehicles will be drawn into the exhaust duct through openings in the ceiling, and discharged at the ventilating buildings.

The amount of air to be supplied depends on the number of vehicles using the tube. As their number increases, the air volume needed to keep carbon monoxide content at a safe limit increases. Automatic equipment will constantly check the carbon monoxide content in the tubes, and the air supply will then be adjusted to hold it at a safe value.

Axial type blowers will be used for introducing fresh air and exhausting vitiated air. These blowers will be placed in two ventilation buildings, one located on each sand island at the ends of the tube. Plans, elevations, and sections of the ventilation buildings are shown in Figures IV-7 and IV-8.

Transition Sections

One of the two transition sections where the Southern Crossing roadways will change from tube to viaduct is shown in Figure IV-9. At these sections the crossing changes from three two-lane roadways in the tubes to two three-lane roadways on the viaduct structure. A length of approximately 600 feet is provided for these transitions so that the change can be made without difficulty to the motorists. These transition sections will be located on the sand islands at the tube portals and will consist of reinforced concrete retaining walls and a roadway slab of varying thickness to counteract flotation. At each portal, open grid grating will be installed to reduce gradually the light intensity from daylight to the illumination level inside the tubes.

BAY VIADUCT

The Bay viaduct will extend toward both shores from the ends of the transition sections at the sand islands. On the San Francisco end this viaduct will be about 5,300 feet in length and will connect near the shore line to the Third and Army Interchange. On the easterly end the viaduct will be about 22,000 feet in length, and will connect with the toll plaza located on the mole section which extends west from Bay Farm Island.

The viaduct will be composed of a series of identical reinforced concrete spans supported on reinforced concrete piles. Figure IV-10 shows a cross-section of the viaduct structure proposed during the 1948 studies. Recent technical improvements in materials and handling procedures are being considered in a redesign of the structure. The studies now being made embrace both precast and cast-in-place sections, as well as prestressed and non-prestressed designs.

Each of the parallel roadways will be 38 feet wide, providing a six-lane divided section. Poles for highway illumination will be mounted in the raised 6-foot median.

The west viaduct will ramp down from approximate elevation +20' at the San Francisco shore, on a -0.15% grade, to about elevation +12' at the west sand island. The east viaduct will rise from elevation +12' at the east sand island on a +0.15% grade to cross over a crash boat channel at about elevation +22'. From this point it will descend on a -0.30% grade to cross under the approach path to the Alameda Naval Air Station seadrome at elevation +12', thence continuing westward at elevation +12' to the mole fill.

MOLE FILL

Between the east end of the viaduct and the Bay Farm Island shore, a distance of about 6,000 feet, a sand fill will be pumped in by hydraulic means. A cross section of this mole fill is shown in Figure IV-11, and a plan and elevation in Figure IV-12. This portion of the crossing will be six lanes divided.

The sand fill will be retained by quarry waste rock dikes similar to those used for the sand fill in the sand islands on either side of the navigation channel. Slopes exposed to wave action will be protected by heavy riprap. Each roadway will be 36 feet in width, with a six-foot median, paved eight-foot shoulders along the outer lanes, and two-foot shoulders along the inner lanes.

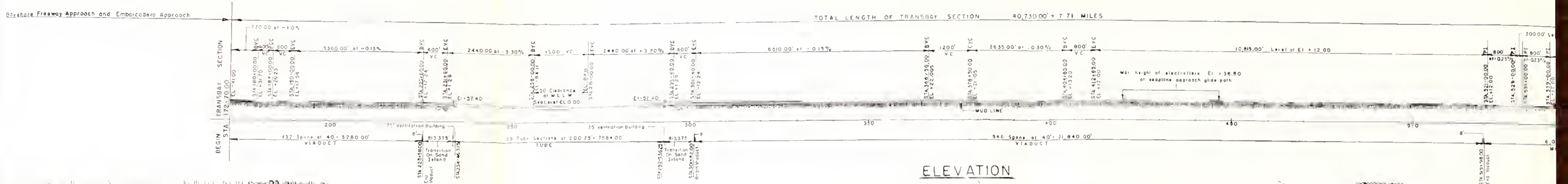
The elevation of the roadway on the mole fill will be 12 feet above sea level. This is the minimum elevation that can be used at this location when considering the combination of unfavorable winds and high-tide conditions.

TOLL PLAZA

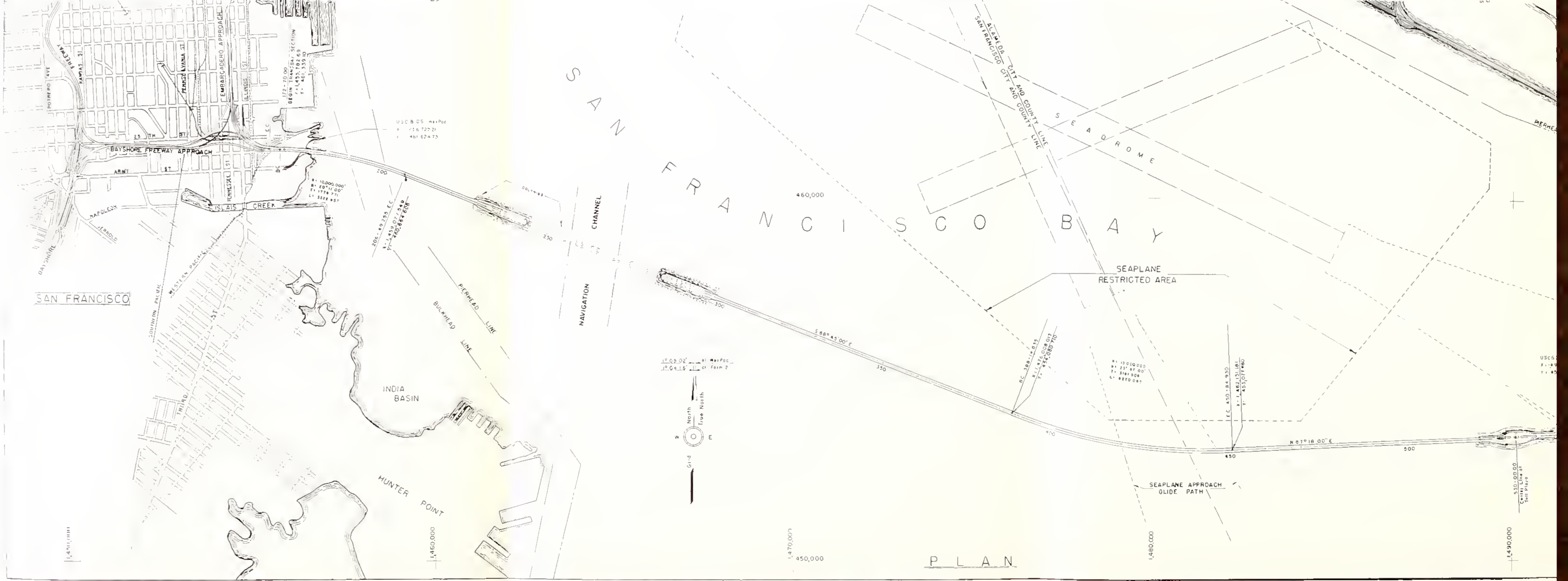
The toll plaza and related facilities will be located at the east end of the mole fill, offshore from Bay Farm Island. This location was selected in preference to other possible alternative locations for the following reasons:

1. The relatively high land values of waterfront property in San Francisco, the presence of a railway yard, and the fact that much of the approach would be on viaduct ruled against a possible San Francisco site.
2. It would be economically impractical to enlarge the sand islands at the tube portals to a size adequate for toll facilities.
3. Since the Southern Crossing will be administered by the staff of the San Francisco-Oakland Bay Bridge, the problem of access between the two toll plazas is important. The location selected is readily accessible to the Bay Bridge Toll Plaza.
4. An offshore location is preferable to an inshore one or one actually on Bay Farm Island because the former is completely separated from possible future residential or commercial developments on the Island and is entirely clear of the approach glide path zones of both the Alameda Naval Air Station and the Oakland Airport.

The principal features of the toll plaza are shown on Figures IV-13 and IV-14. The administration and maintenance buildings will be in the center of the plaza with eight toll lanes for uni-directional traffic on each side. All collections will be made on the driver's side of the vehicle.

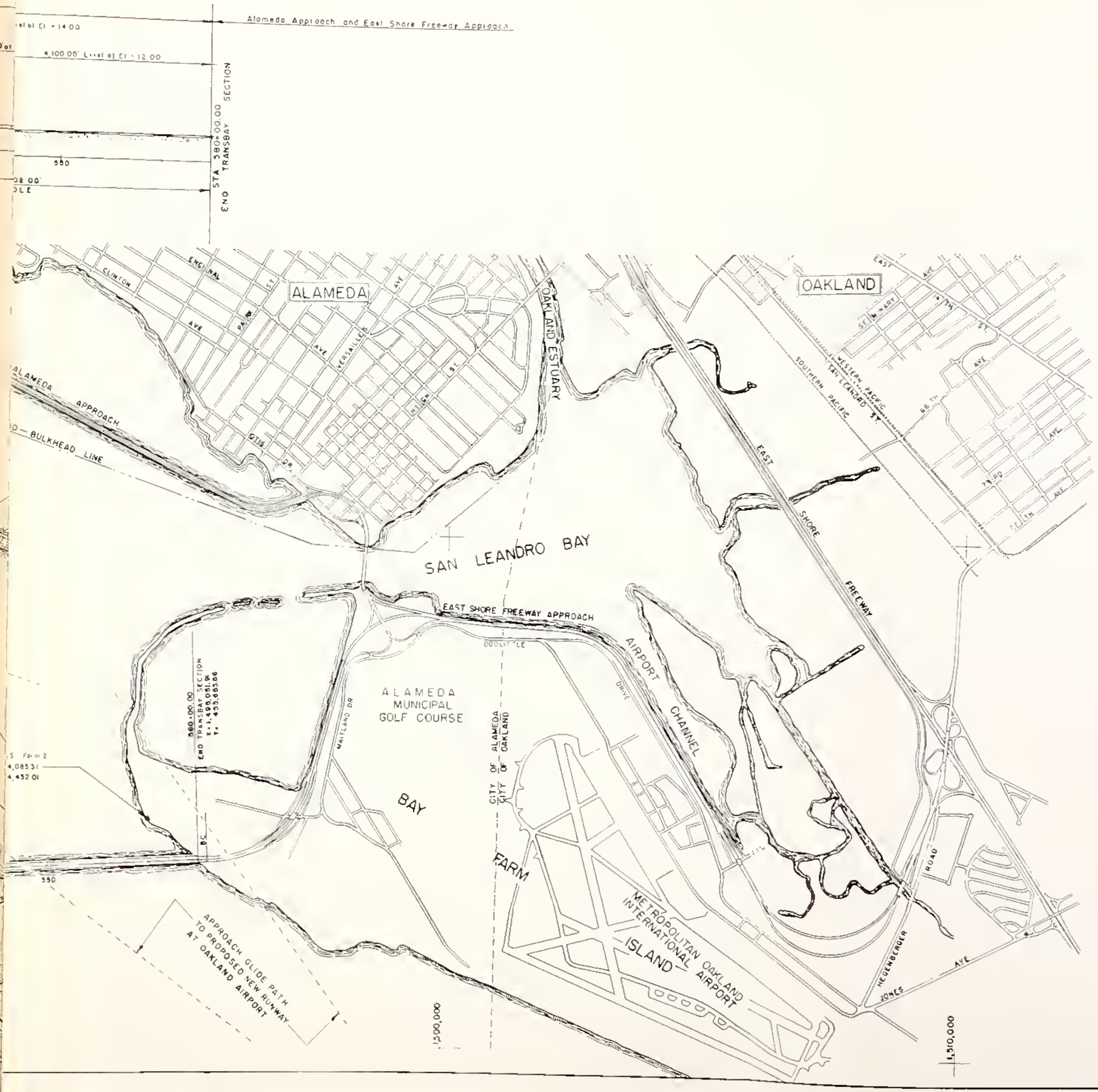


ELEVATION



PLAN

FIG IV-1



NO	CONTRACT
2001	FOUNDATION EXPLORATIONS
2002	BAY TUBE
2003	ESTUARY TUBE
2004	MOLE FILL
2005	BAY VIADUCT
2006	BAY TRANSITION
2007	RAILROAD RELOCATION WORK
2008	BAYSHORE FREEWAY APPROACH
2009	EMBARCADERO APPROACH
2010	WATER LINES
2012	ALAMEDA APPROACH
2013	BUILDINGS AND TOLL PLAZA
2014	EASTSHORE FREEWAY APPROACH
2017	MOLE PAVING
2018	ELECTRICAL WORK
2019	OPERATING EQUIPMENT
2020	TRAFFIC STRIPES AND SIGNS
2022	LANDSCAPING
2023	TOLL COLLECTION EQUIPMENT

Notes:

M.H.H.W. = EL + 2.90 at Potrero Point.
S.L. = EL 0.00 = U.S.C.&G.S. Sea Level Datum of 1929
M.L.L.W. = EL - 3.40 at Potrero Point.

Coordinates, bearings and distances are on the California Coordinate System Zone 3. Multiply distances shown by 1.0000708 to obtain ground level distances.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

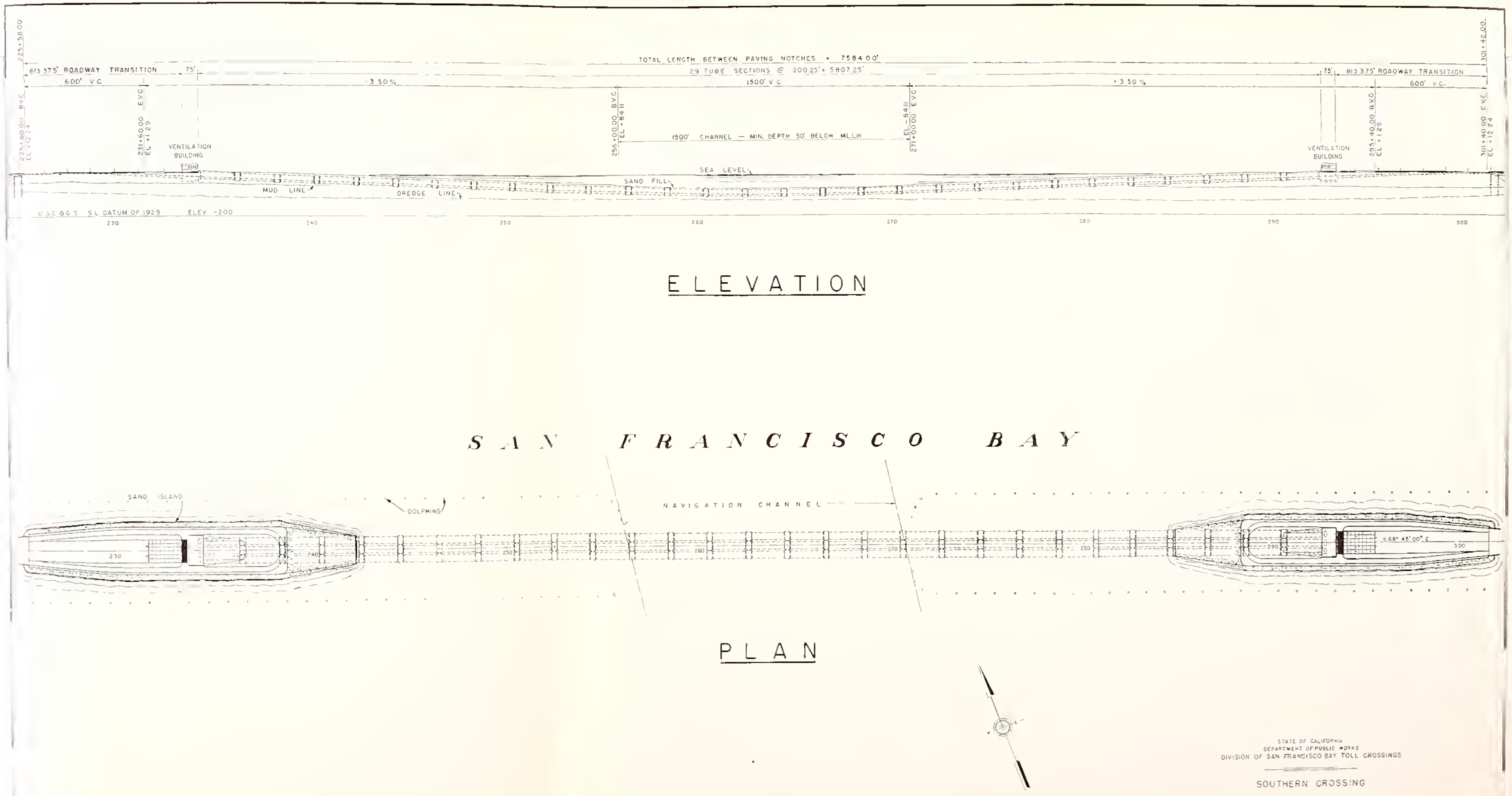
SOUTHERN CROSSING

TRANSBAY SECTION

GENERAL PLAN AND ELEVATION

0 1000 2000
SCALE IN FEET

FIG. IV - 2

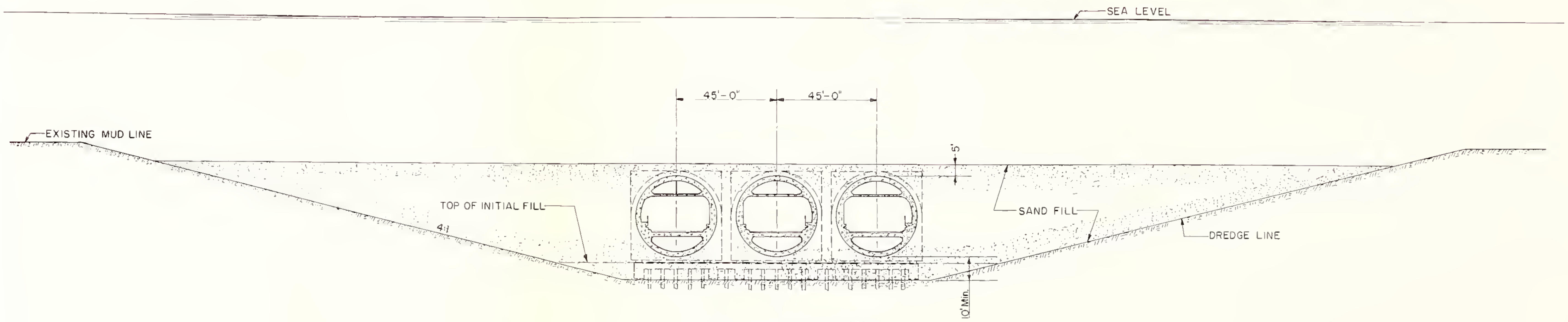


STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

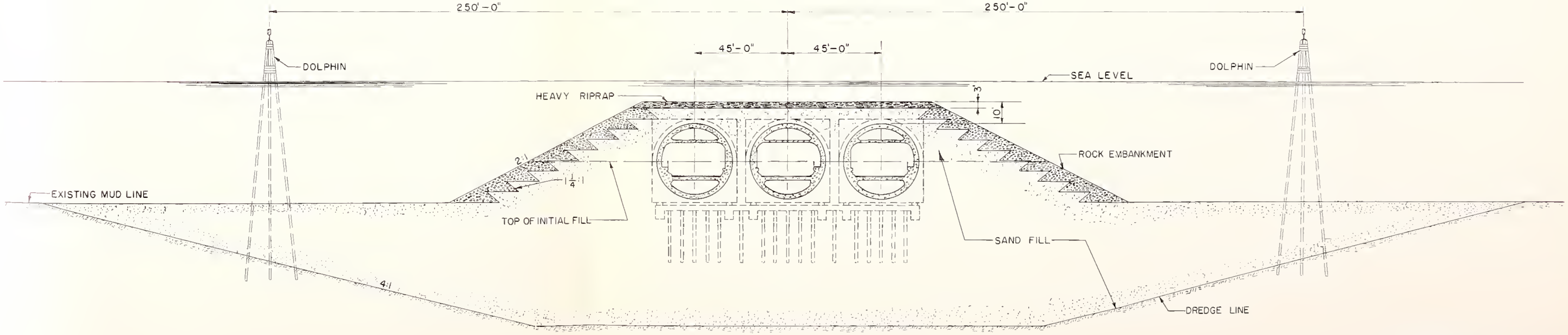
SOUTHERN CROSSING

BAY TUBE

GENERAL PLAN AND ELEVATION



STATION 263+50



STATION 245+00

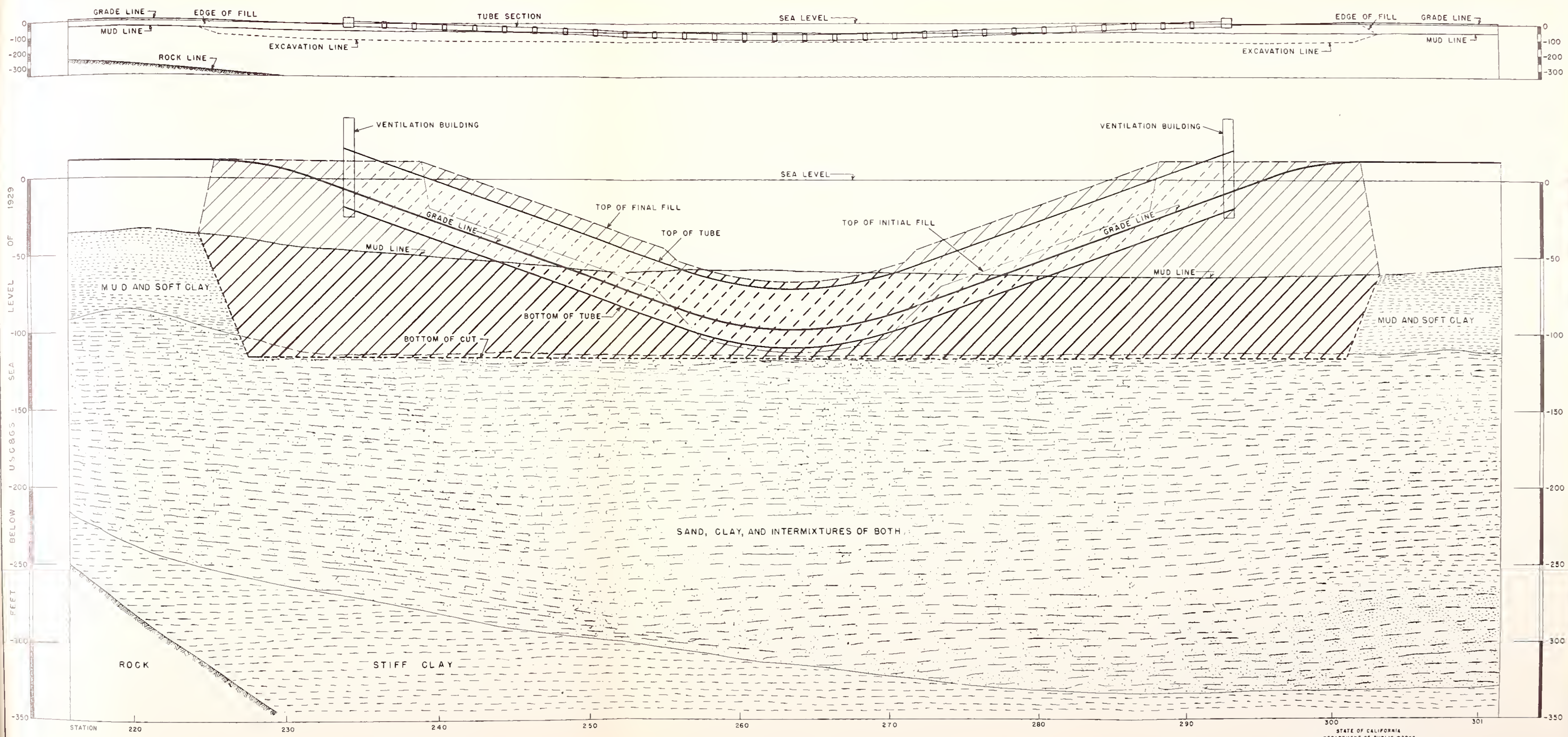
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

BAY TUBE

TYPICAL SECTIONS

0 20 40 60
SCALE IN FEET



EXCAVATION & FILL

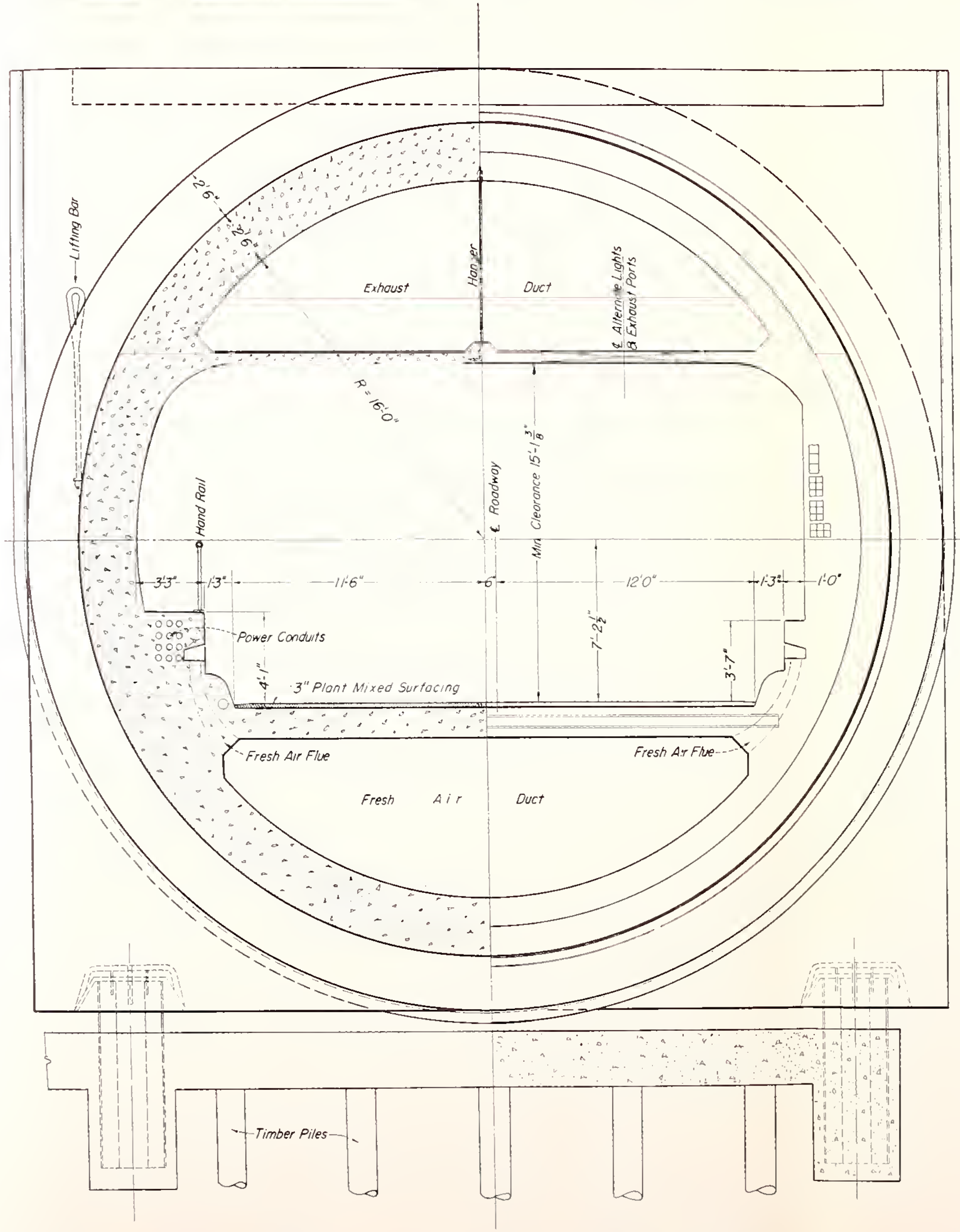
▨	Light line: Fill above Mud Line
▨	Heavy line: Excavation & Fill below Mud Line

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

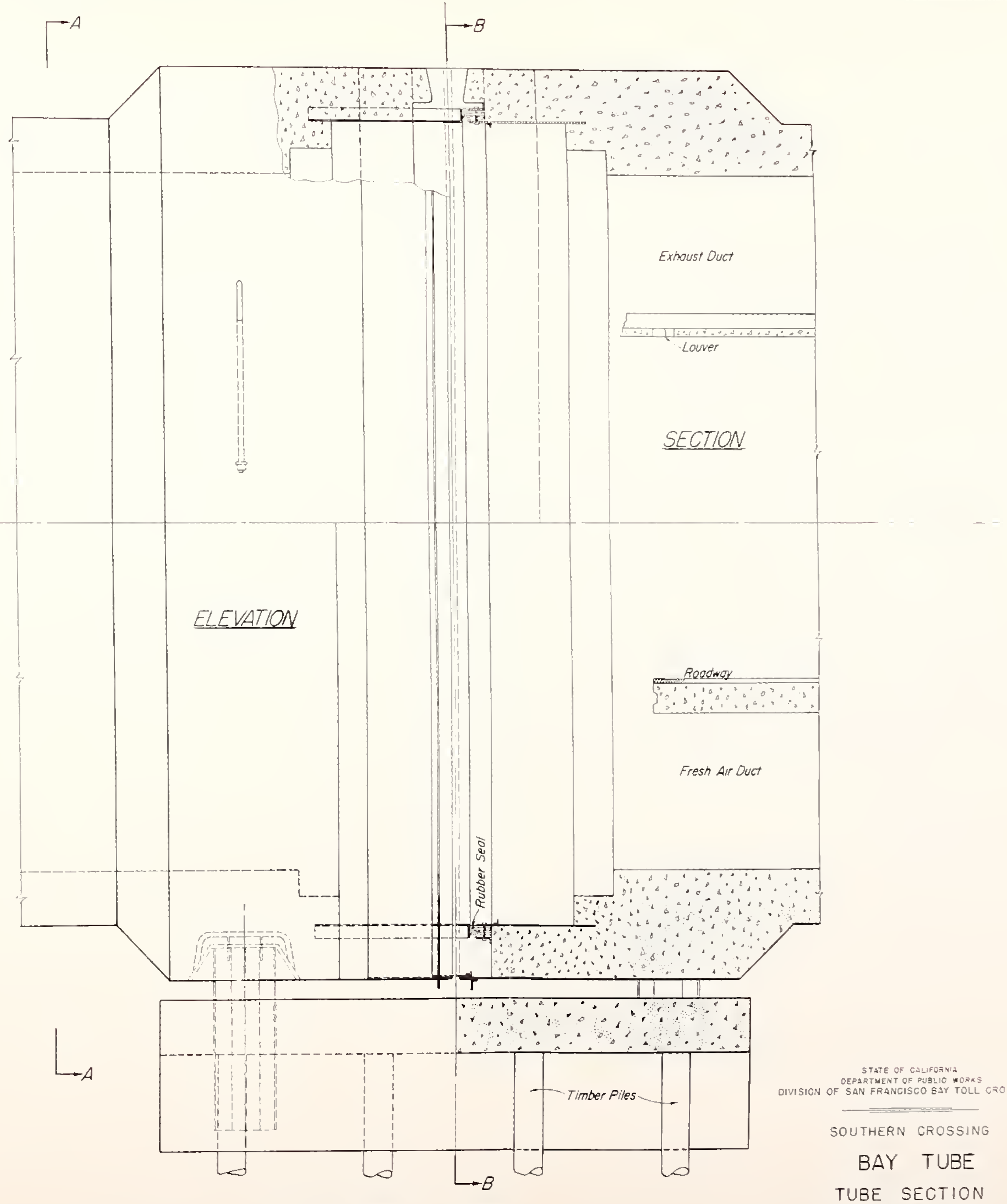
BAY TUBE
SAND FILL

0 100 200 400 600 800 1000
HORIZONTAL SCALE IN FEET
VERTICAL SCALE: AS SHOWN



LEFT HALF SECTION A-A

RIGHT HALF SECTION B-B



TYPICAL FOOTING & COLLAR

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

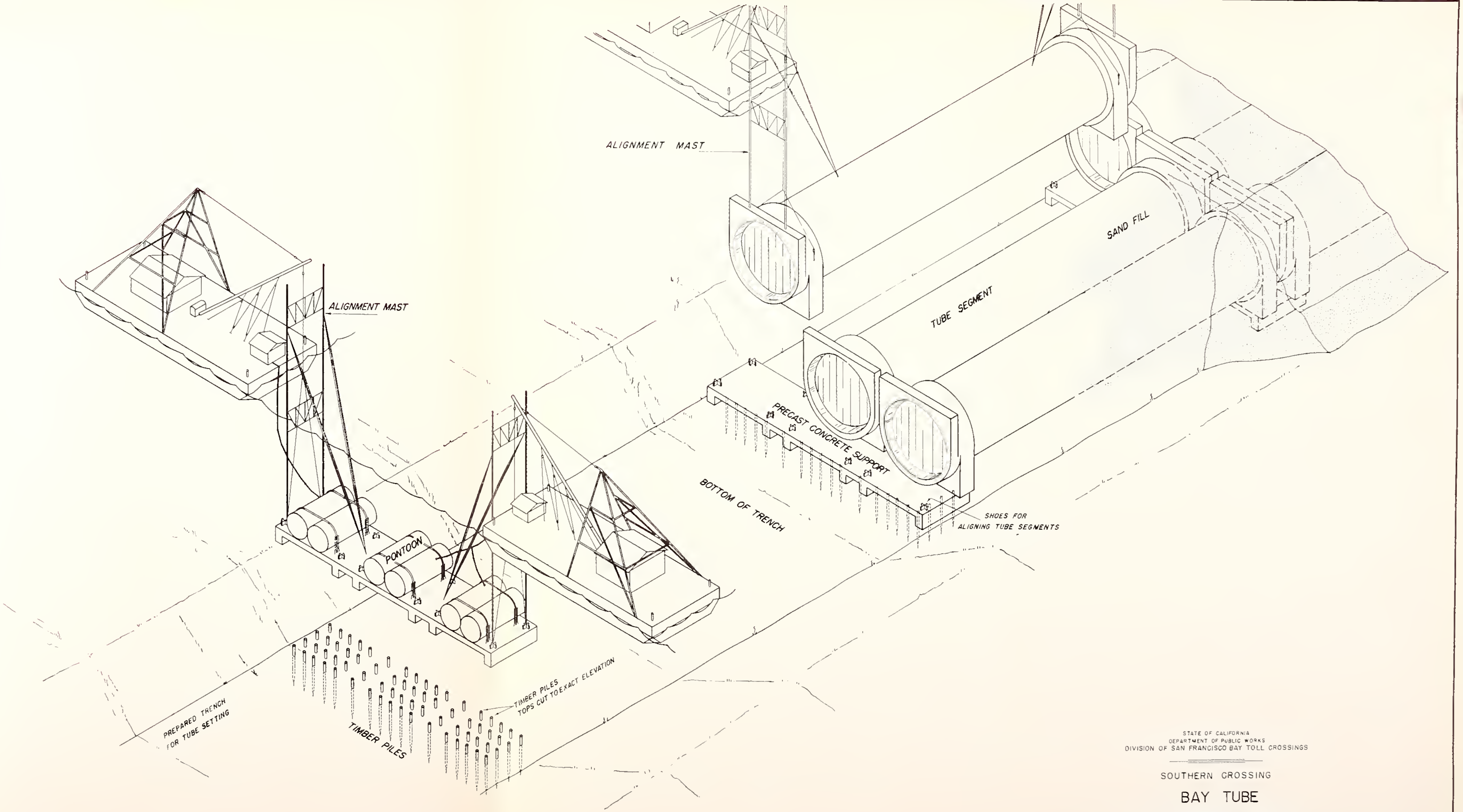
SOUTHERN CROSSING

BAY TUBE

TUBE SECTION

0 1 2 3 4 5 6 7
SCALE IN FEET

FIG. IV-6



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

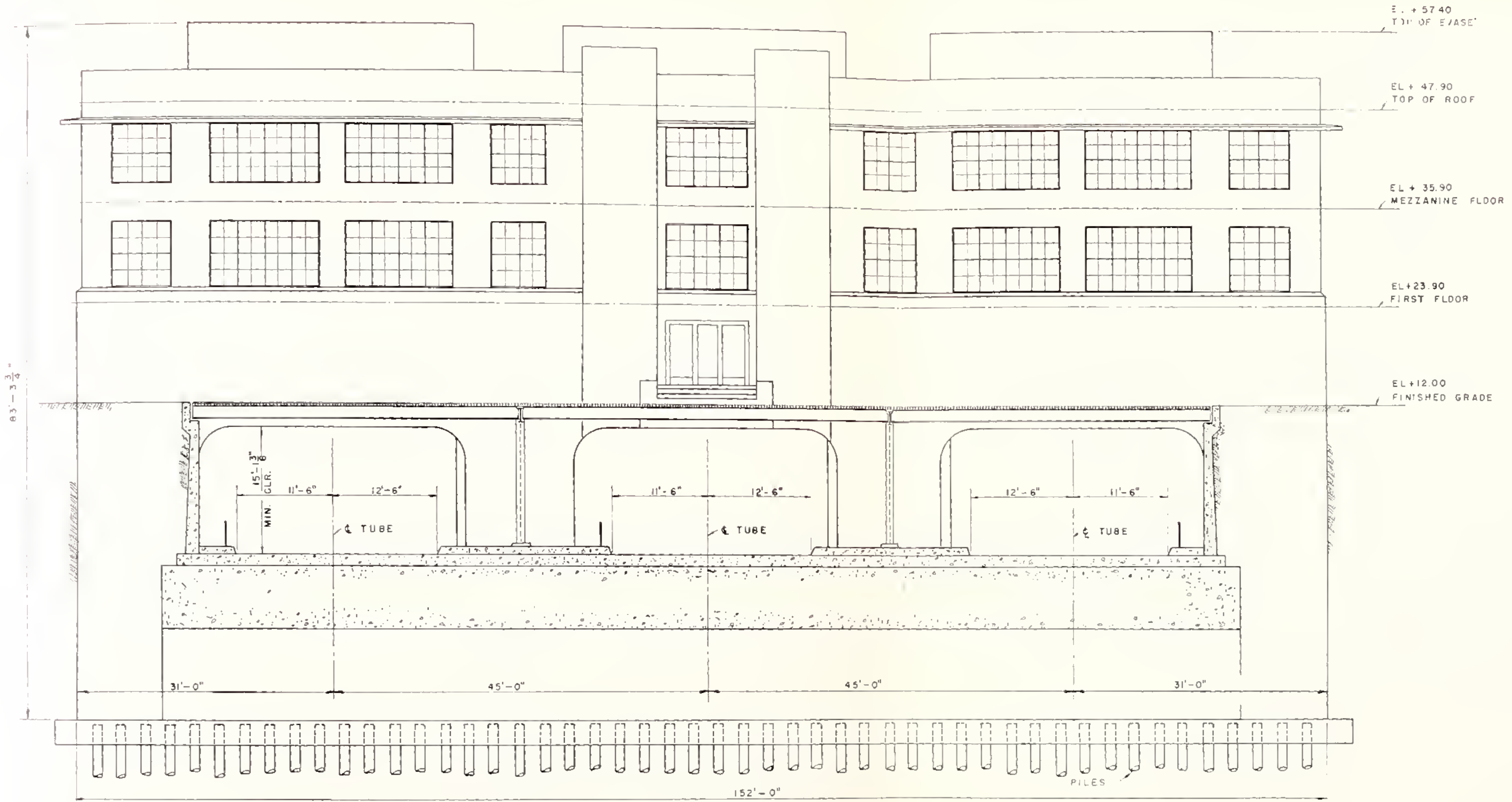
SOUTHERN CROSSING

BAY TUBE

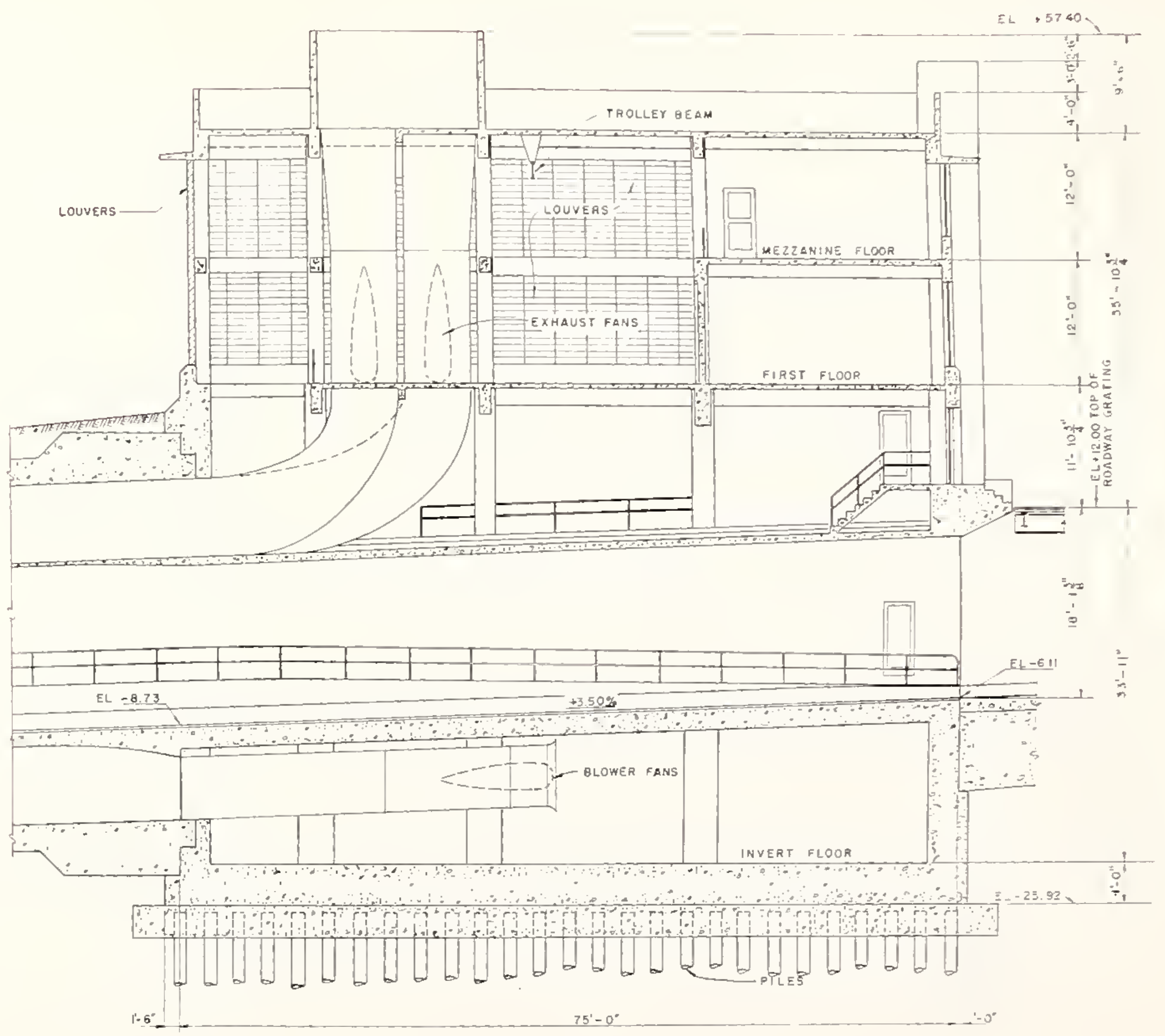
TUBE SINKING PROCEDURE

10 0 10 20 30 40 50
SCALE IN FEET

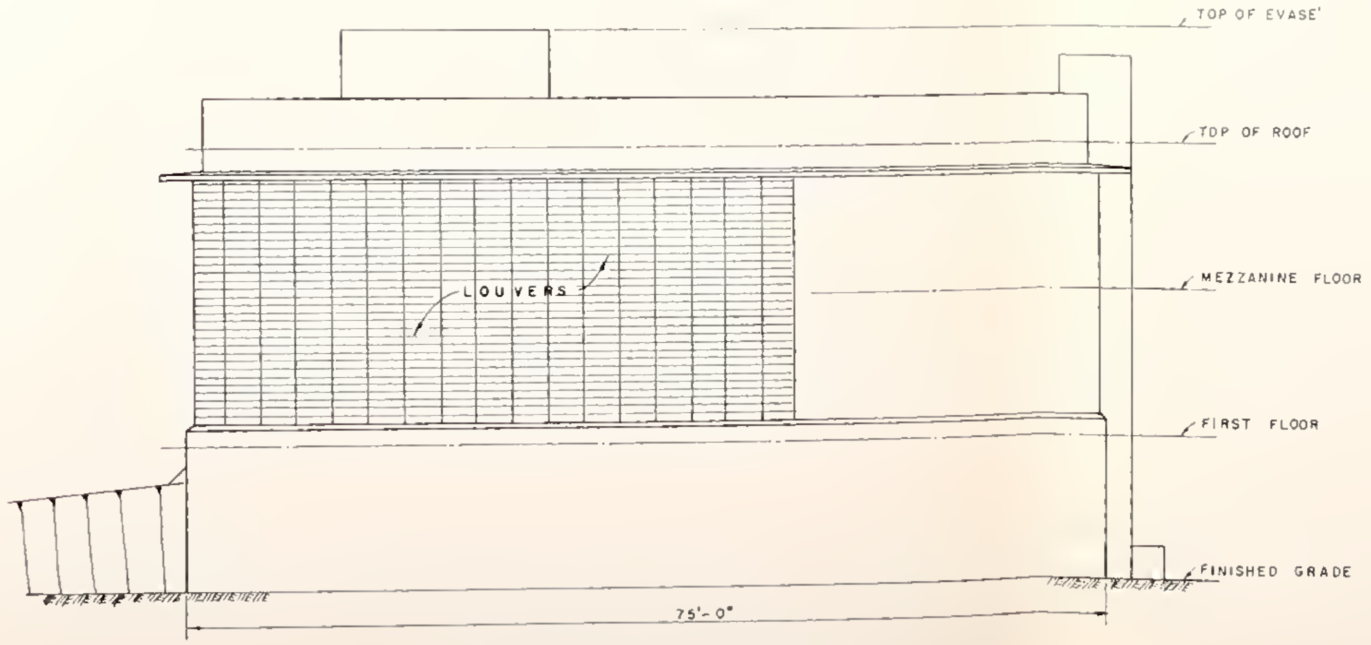
FIG. IV-7



FRONT ELEVATION



LONGITUDINAL SECTION



SIDE ELEVATION

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

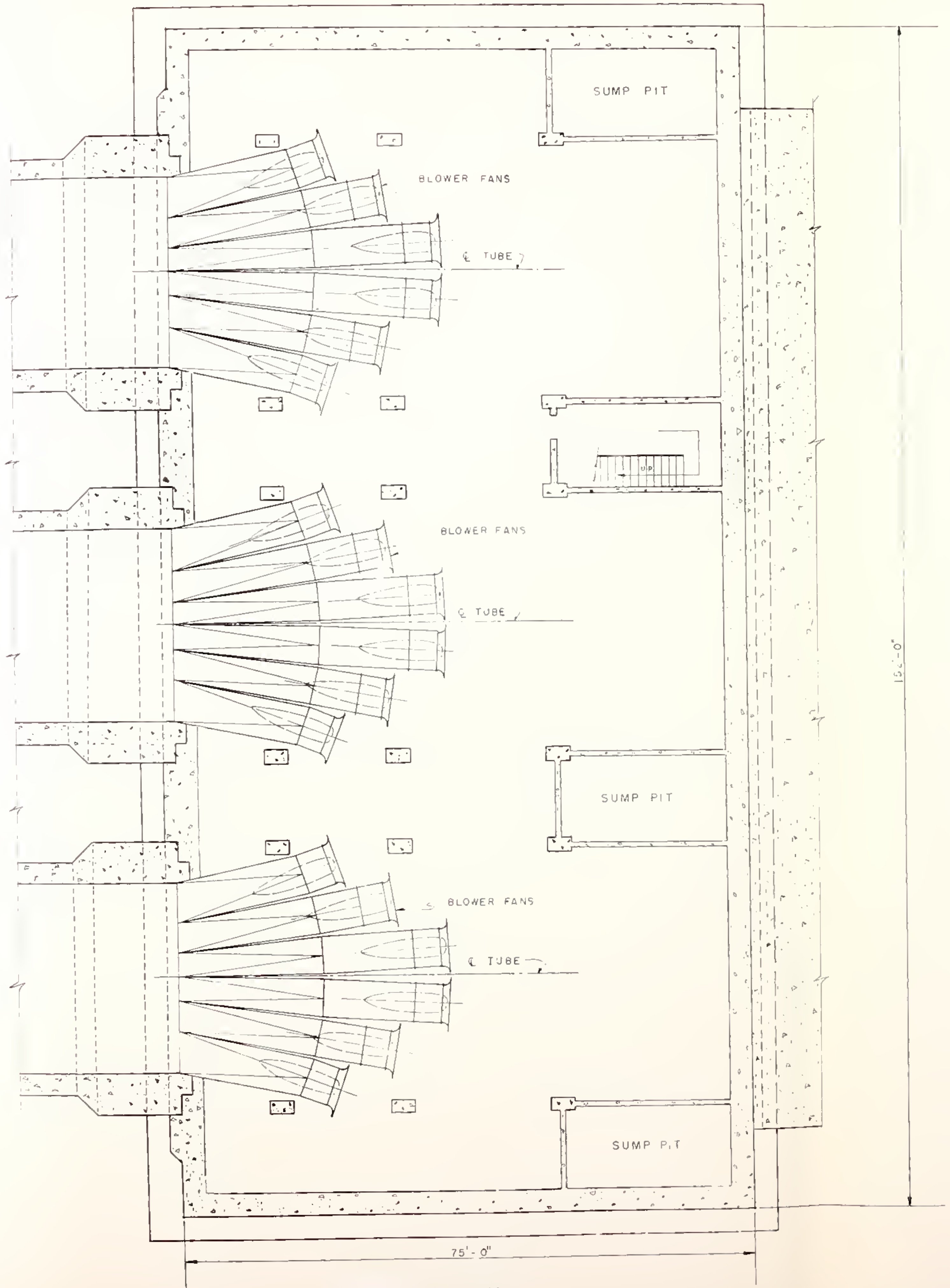
SOUTHERN CROSSING

BAY TUBE

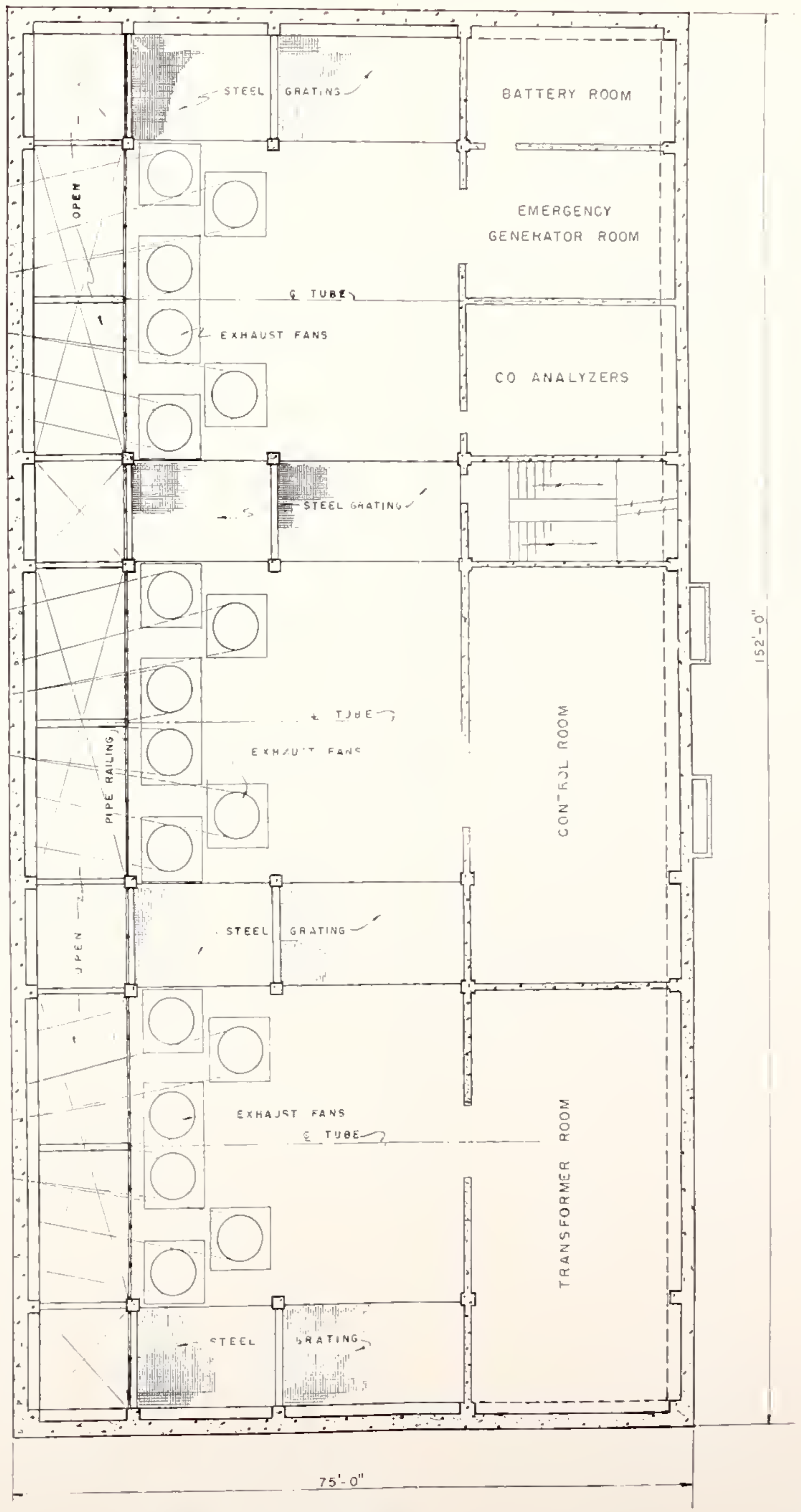
VENTILATION BUILDING

SECTION AND ELEVATIONS

0 5 10 15 20
SCALE IN FEET



INVERT PLAN



FIRST FLOOR PLAN

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

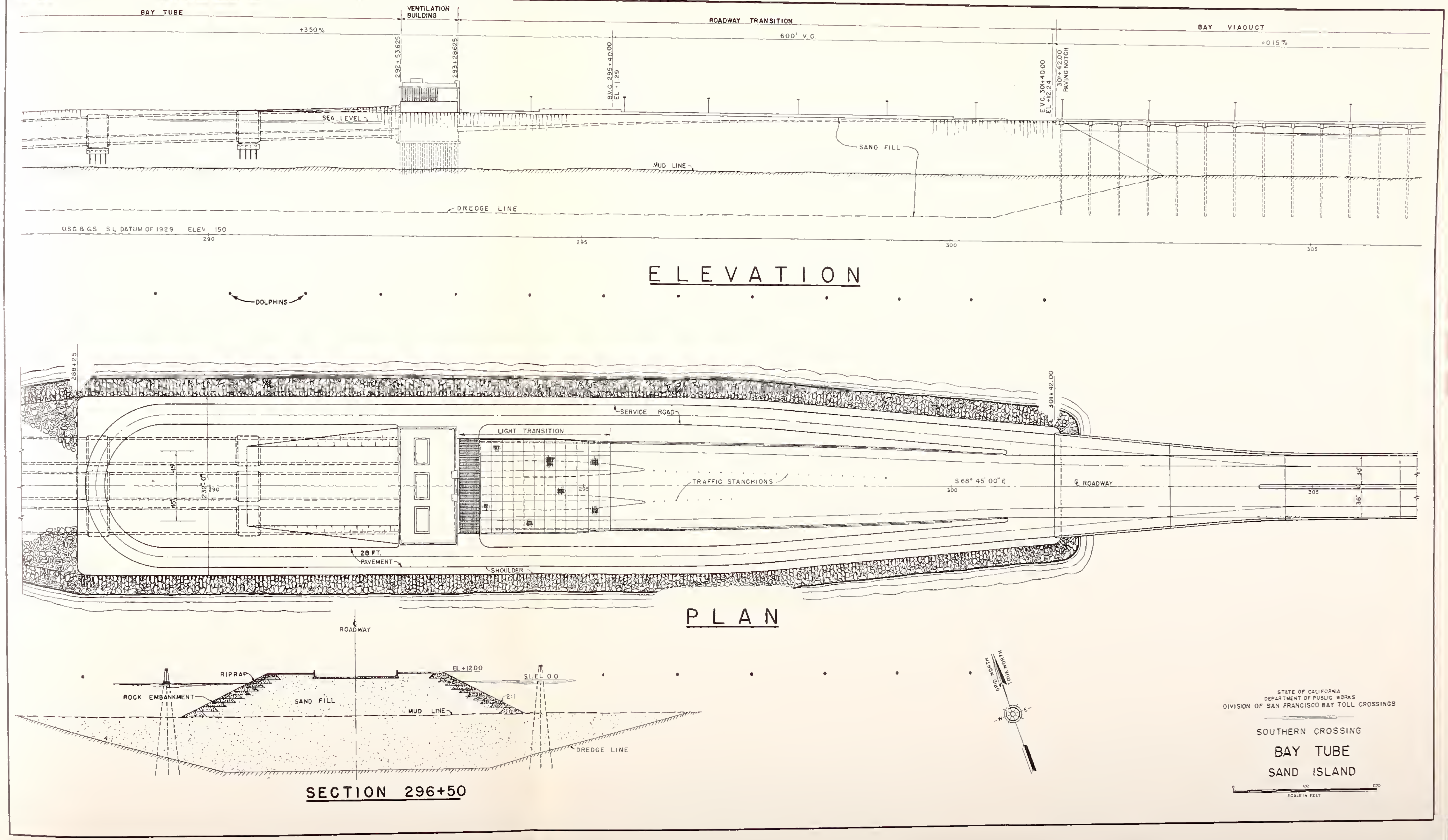
SOUTHERN CROSSING

BAY TUBE

VENTILATION BUILDING
INVERT AND FIRST FLOOR PLANS

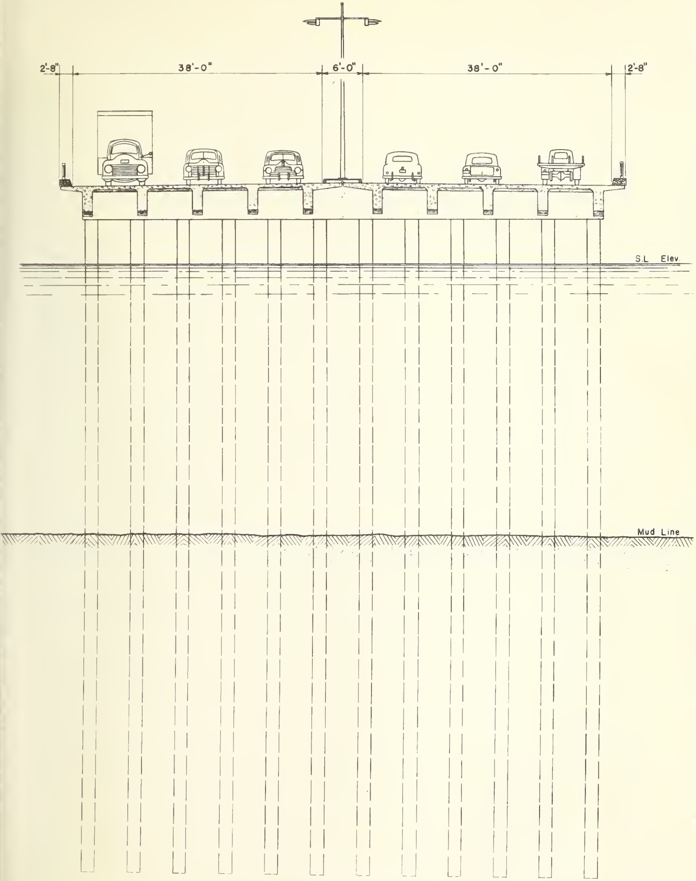
0 5 10 [illegible] 20
SCALE IN FEET

FIG. IV-9



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING
BAY TUBE
SAND ISLAND



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

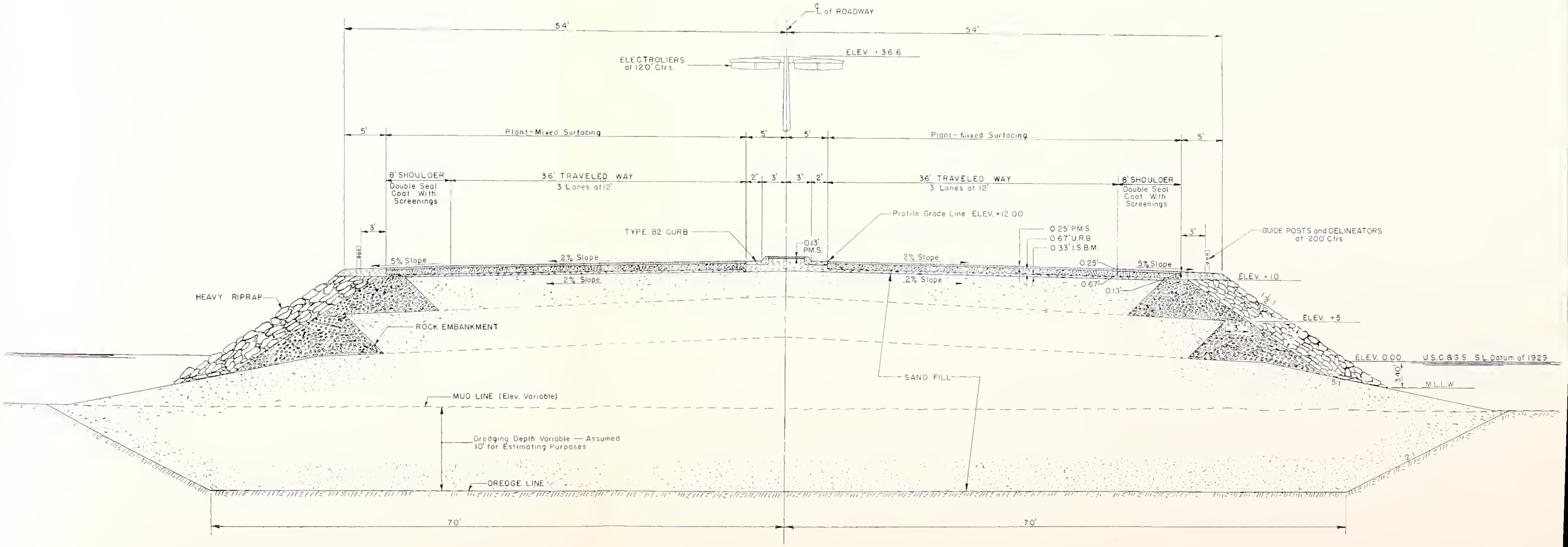
SOUTHERN CROSSING

BAY VIADUCT

TYPICAL SECTION

0 5 10 20 30
SCALE IN FEET

FIG. IV-1



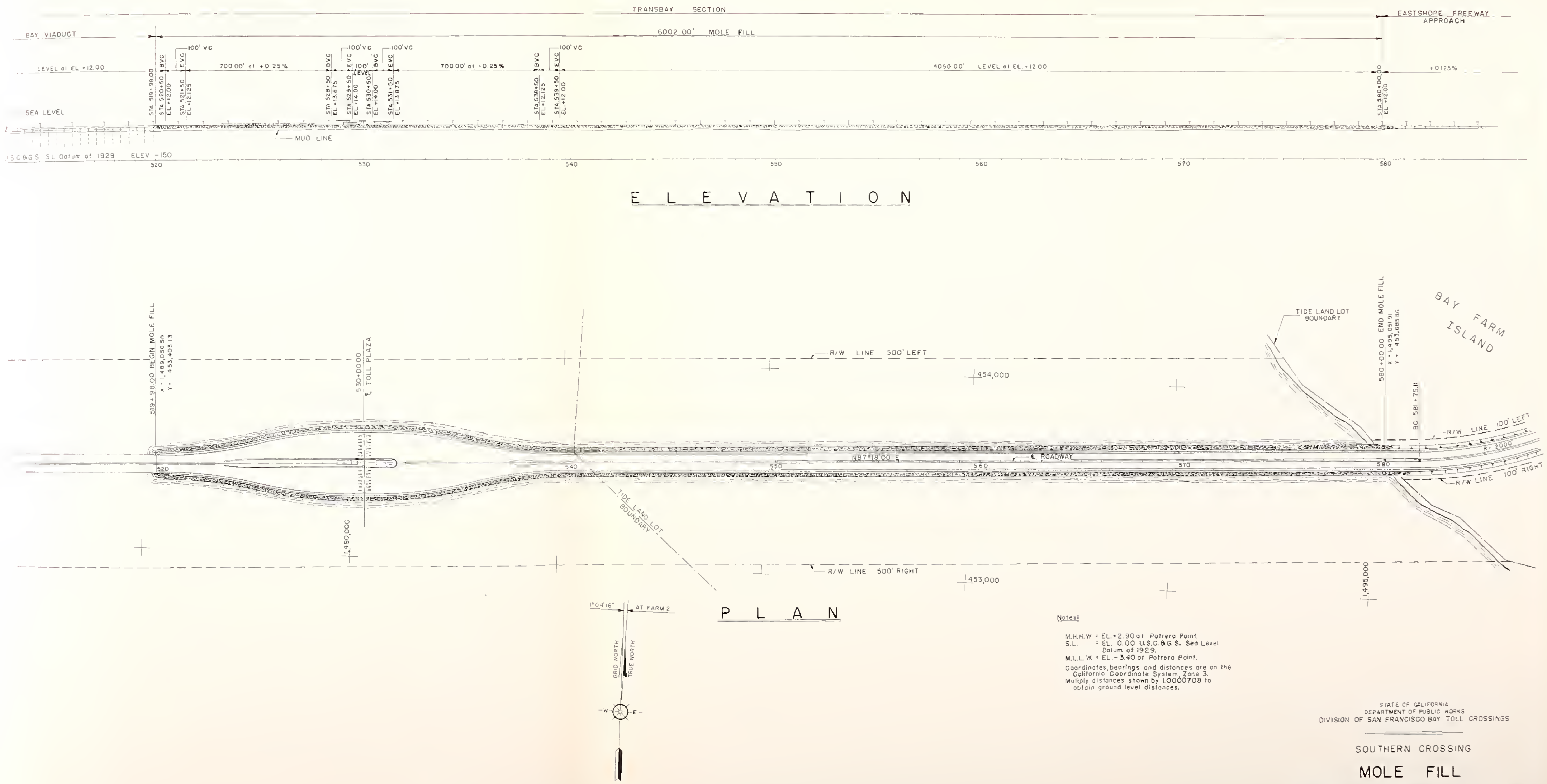
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

MOLE FILL

TYPICAL SECTION

SCALE IN FEET



Notes:

M.H.H.W = EL. +2.90 at Potrero Point.
S.L. = EL. 0.00 U.S.C.&G.S. Sea Level Datum of 1929.
M.L.L.W. = EL. -3.40 at Potrero Point.

Coordinates, bearings and distances are on the California Coordinate System, Zone 3.
Mutiply distances shown by 1.0000708 to obtain ground level distances.

STATE OF CALIFORNIA
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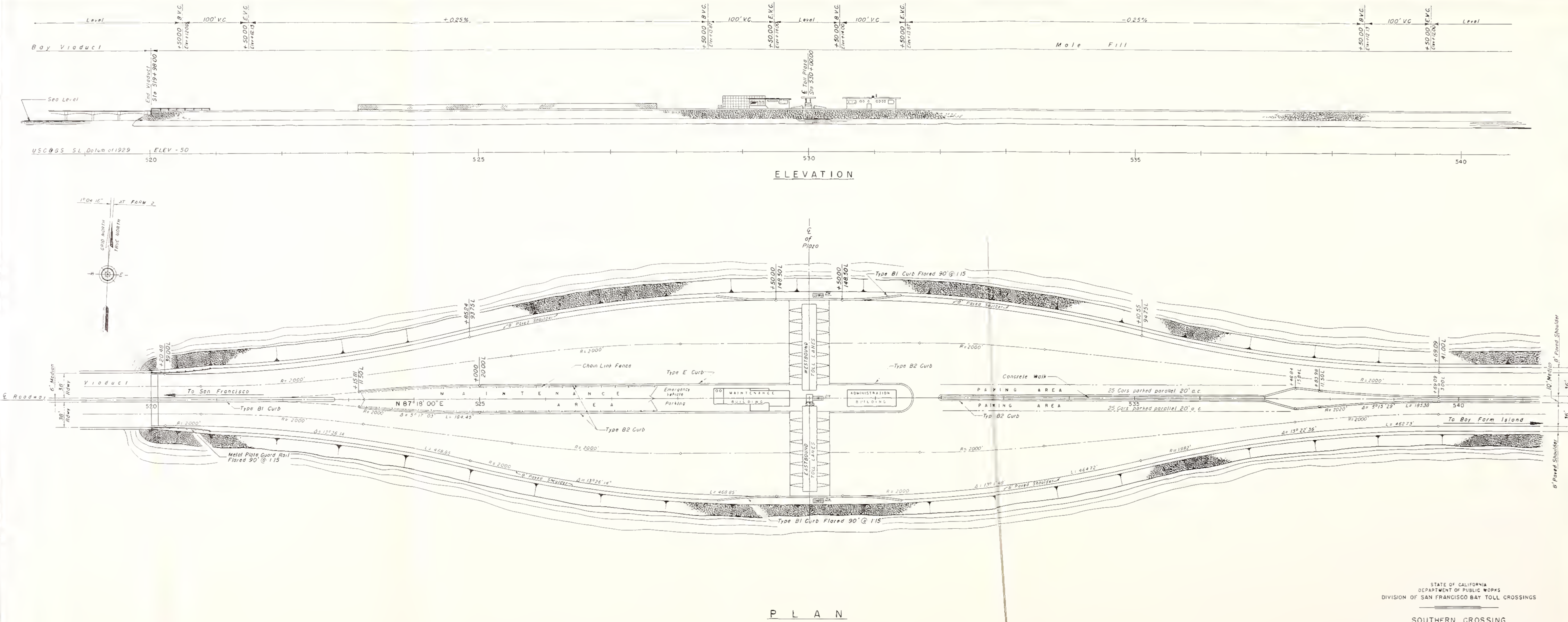
SOUTHERN CROSSING

MOLE FILL

GENERAL PLAN AND ELEVATION

0 100 200 400 600
SCALE IN FEET



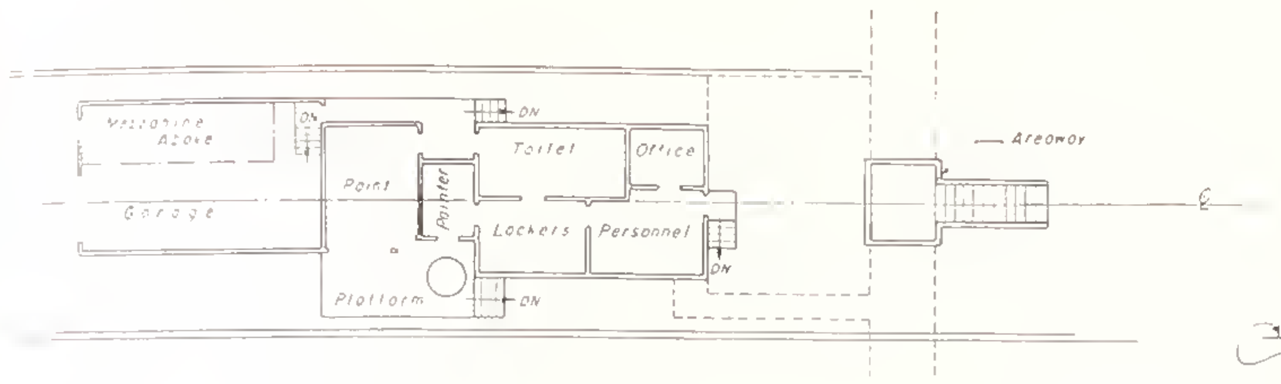
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

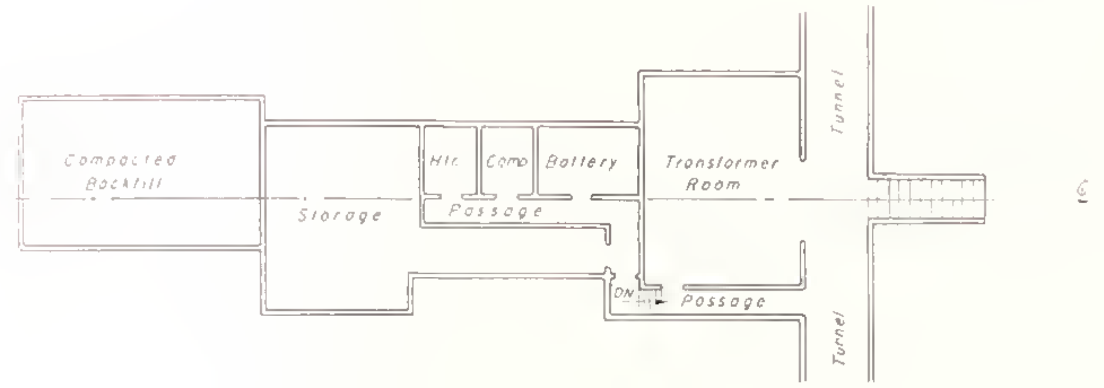
BUILDINGS AND TOLL PLAZA

TOLL PLAZA — PLAN AND ELEVATION

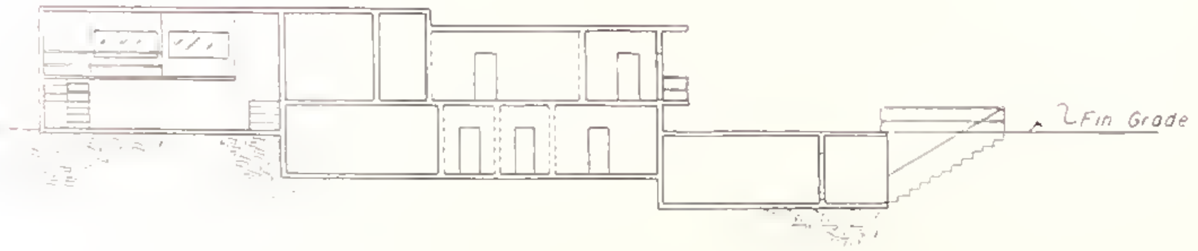
0 50 100 150
SCALE IN FEET



FIRST FLOOR PLAN

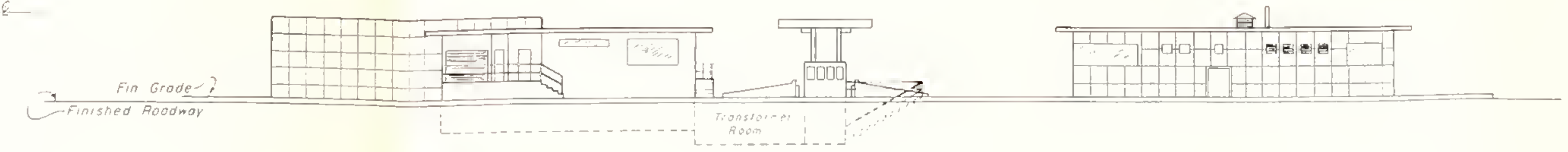


BASEMENT PLAN

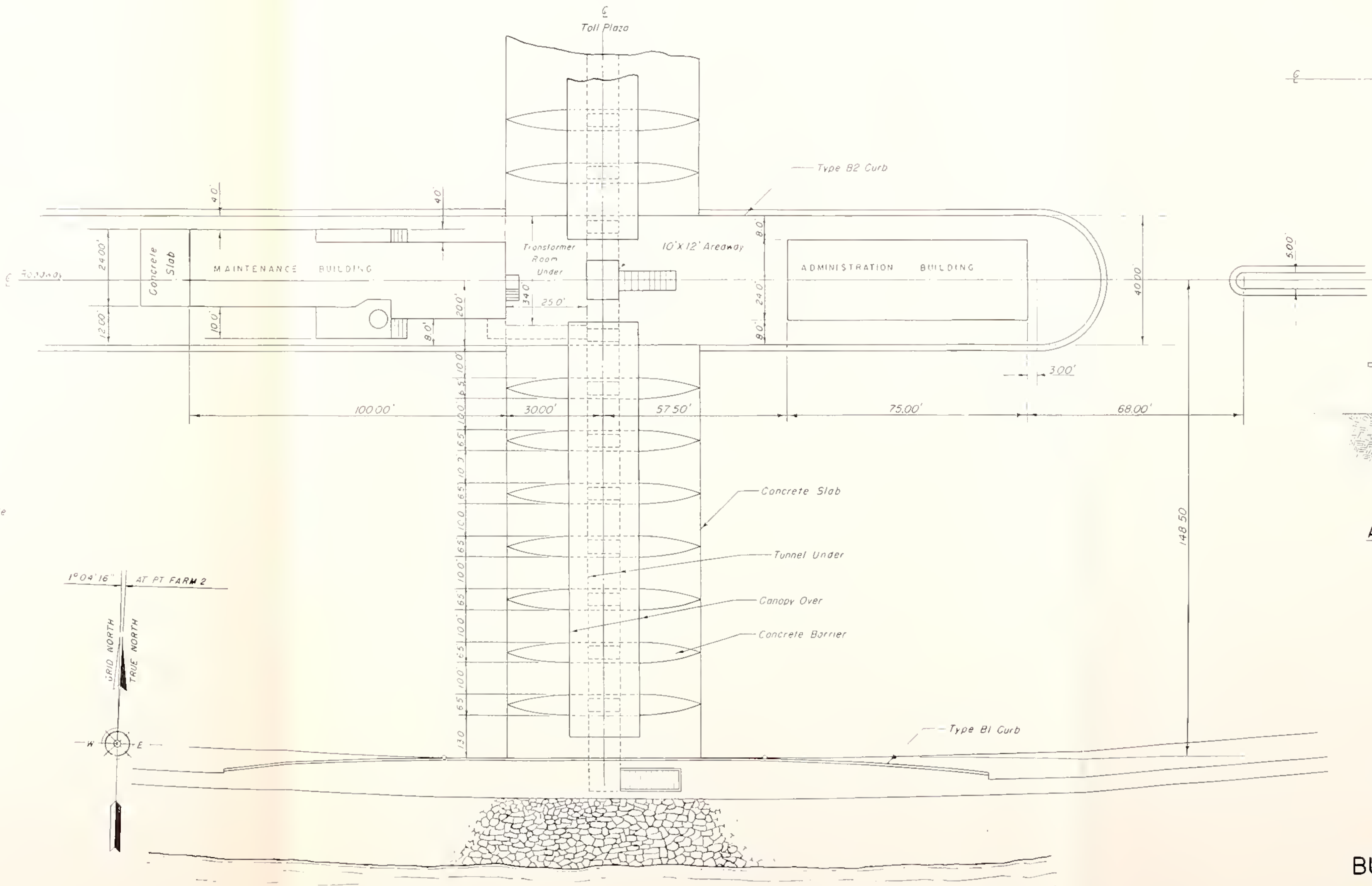


℄ SECTION

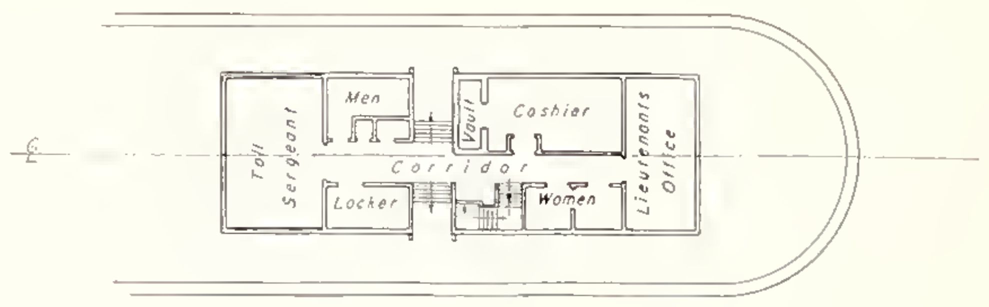
MAINTENANCE BUILDING



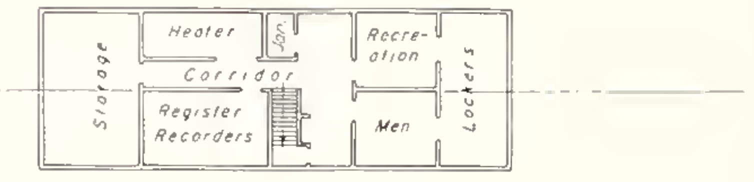
ELEVATION



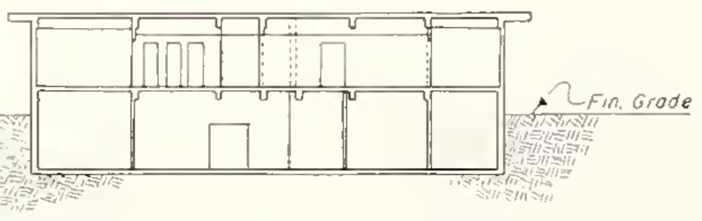
PLAN



FIRST FLOOR PLAN



BASEMENT FLOOR PLAN



℄ SECTION

ADMINISTRATION BUILDING

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

BUILDINGS & TOLL PLAZAS

BUILDINGS — PLANS & SECTIONS

0 20 40 60
SCALE IN FEET

PART V

SAN FRANCISCO APPROACHES

The San Francisco Approaches to the Southern Crossing extend westerly and northerly from the interchange at Third and Army Streets, which is adjacent to the bridgehead. This approach system is divided into two main sections: (1) the Bayshore Freeway Approach, and (2) the Embarcadero Approach, which are shown on Figures V-1 and V-3.

BAYSHORE FREEWAY APPROACH

This approach extends from the bridgehead to the Bayshore Freeway in the vicinity of 26th Street. It consists of the following components: (1) the Third and Army Interchange, (2) the Army Freeway, and (3) the Bayshore-Army Freeway Interchange.

Third and Army Interchange

The Third and Army Interchange will collect and distribute traffic to and from the Southern Crossing and the Army, Embarcadero, and Southern Freeways. (The Southern Freeway, sometimes called the "Alemany Freeway", or "Crosstown Freeway", is currently being planned by the City of San Francisco and the State Division of Highways.) The Interchange will also provide on- and off-connections to Third Street at (1) Army Street and (2) 23rd Street.

The Third and Army Interchange will be located in the area immediately north of Army Street, extending on both sides of Third Street from Michigan to Pennsylvania Street, and will be elevated to clear city streets and railroad track

The rotary type of interchange selected during the 1948 Southern Crossing studies now appears inappropriate from a traffic standpoint, and a more direct type of interchange is now contemplated. It is believed that when the current traffic study is completed, an entirely different traffic-flow pattern will be found from that predicted in 1948. This will be due to the following factors: (1) the approach connection specified by the Statutes differ from those planned in 1948, (2) additional freeways are planned to be constructed by othe agencies, and (3) traffic desires have changed.

The main differences between the approach connections specified by the Statutes and those planned in 1948 which affect the Third and Army Interchange are:

(a) The Statutes call for a freeway connection to the Bayshore Freeway with on- and off-ramps thereto in both directions, whereas the 1948 plan was to provide on- and off-connections to the south leg of the Bayshore Freeway only.

(b) The Statutes call for a freeway connection to the Embarcadero, whereas the 1948 report recommended a Tennessee - 6-1/2 Street Freeway to the business district and to the Bay Bridge approach system.

The effect of these changes will be to route the greater portion of Southern Crossing traffic to the business district via the Bayshore Freeway rather than the Embarcadero Freeway.

Mention has been made of the "Southern Freeway" planned by the City of San Francisco. The eastern section of this freeway will be a connection between Bayshore Freeway at

Alemany Boulevard and the Southern Crossing Third and Army Interchange. Planning of the Southern Crossing must recognize the probability of construction of this freeway, and provisions must be made for its connection at the Third and Army Interchange. Traffic from the peninsular area to the San Francisco waterfront areas and to the Southern Crossing will probably choose this freeway in preference to the Army Freeway. See schematic drawing on page V-10.

The net result of these changed conditions will be to alter the flow pattern at the Third and Army Interchange so that a careful redesign is required to serve traffic properly. Figure V-2 shows a preliminary layout of the design now contemplated.

Army Freeway

The Army Freeway will be a link about one mile long between the Third and Army Interchange and the Bayshore Freeway, with the connection to the latter immediately north of the existing Bayshore-Army Street Interchange. There will be no intermediate points of ingress or egress.

The topography along the line of this proposed freeway is rather precipitous, and will necessitate deep cuts and high fills or viaducts. Connecticut, Pennsylvania, and Iowa Streets will cross the freeway; all other north-south streets between Third Street and Bayshore Freeway will be closed.

This freeway will cross over the south portal of a railroad tunnel on the main line of the Southern Pacific into

San Francisco. However, the freeway construction will not cause any interference with railroad operation.

Bayshore-Army Freeway Interchange

The interchange between the Bayshore and Army Freeways will be located in the general vicinity of 26th Street, and will extend from the existing 23rd Street bridge over the Bayshore Freeway to the existing viaduct over the Army Street-Potrero rotary. In accordance with the requirements of the Statutes, ramps must be provided in both directions to permit Southern Crossing traffic to turn either north or south on the Bayshore Freeway. Connections to city streets must also be provided.

The planned Southern Freeway will offer a more direct route between the Bayshore-Alemany Interchange and the Third and Army Interchange, thereby eliminating practically all traffic traveling between the Army Freeway and the south leg of the Bayshore Freeway. Traffic remaining on this interchange would consist primarily of automobiles moving between the Army Freeway and the north leg of the Bayshore Freeway.

Preliminary studies by this Division in 1948 and 1949 indicated that the interchange between the Bayshore and Army Freeways would be a three-level separation, with the ramp to the south leg going beneath the Bayshore Freeway and the ramp to the north leg above. At the time these studies were made, it was contemplated the interchange construction would precede that of the Bayshore Freeway, with only nominal interference to existing traffic. The fact that the Bayshore

Freeway is now open presents construction difficulties and traffic handling problems which will warrant a detailed study and possible redesign of the interchange.

EMBARCADERO APPROACH

The Embarcadero Approach will be a freeway connection between the Third and Army Interchange and the business and waterfront areas to the north. The major portion of this freeway will be a double-decked elevated structure. See Figure V-3.

Beginning at the Third and Army Interchange the freeway will follow the east side of Tennessee Street northward to 18th Street; thence the alignment will curve eastward, crossing at Mariposa to the east side of Third Street. Connections will be provided to the city streets at 23rd, 19th, and Mariposa Streets. See Figure V-4. The freeway will continue northerly parallel with Third to its intersection with Fourth Street, where it branches, with one leg (the Fourth Street Connection) going up the west side of Fourth to the intersection of Fourth and Brannan Streets. See Figures V-5 and V-8. The other leg swings easterly to cross over China Basin at The Embarcadero, thence continues along The Embarcadero to a connection with the portion of the Embarcadero Freeway which extends northerly from Howard Street and which is now planned by the Division of Highways. Ramps connecting with city streets will be provided at Main and Harrison, Spear and Harrison, and Howard and Mission on The Embarcadero, all as specified by the Statutes. See Figures V-6 and V-7.

The essential features of the Embarcadero Freeway, with the exception of the connection to the intersection of Fourth and Brannan Streets, were studied by this Division in 1948 and 1949 and were shown in the Division's 1949 Report (Figure VII-2, 1949). Some changes in alignment, however, have been made to reduce property damage.

The branch of the Embarcadero Approach which swings eastward to the waterfront is an elevated double-decked structure, with two lanes on each of the one-way decks. Figures V-5, V-6, and V-7 show this approach and the connections to various streets as required in the Statutes.

On the south side of China Basin the freeway will be a steel girder viaduct built above the present Santa Fe railway yard, which is on land controlled by the Board of State Harbor Commissioners. The present plans of the Board call for the railway yard to be relocated elsewhere, and for warehouses to be constructed in this area.

A steel truss cantilever bridge providing a vertical clearance of 135 feet above M.H.H.W., in accordance with the Statutes, will be built across China Basin. The center span will be 600 feet, and each of the two side spans 300 feet long. An application for a permit to build such a crossing has been submitted to the Corps of Engineers, U. S. Army.

Northward from the China Basin crossing the freeway will be a girder viaduct built directly over The Embarcadero. The street level below will remain available for truck and other local traffic and for railroad switching operations to and from the various piers and waterfront industries. At the north end, in the vicinity of Howard Street, the structure will connect with the Embarcadero Freeway viaduct now being planned by the State Division of Highways.

Connections to city streets will be made at the following points:

Intersection	Type of Connection
Main and Harrison	Northbound off-ramp
Spear and Harrison	Southbound on-ramp
Howard and The Embarcadero	Southbound on-ramp
Mission and The Embarcadero	Northbound off-ramp

All of the foregoing will have maximum grades of 6 per cent.

Fourth Street Connection

Since none of the previous studies made by this Division had envisioned a connection to the intersection of Fourth and Brannan Streets, as required by the Statutes, a study was necessitated to determine how this problem could best be solved. Three alternatives were investigated, as follows:

1. Swinging the main trunk of the Embarcadero Freeway somewhat to the west to allow a crossing of Channel Street in the vicinity of Fourth Street, with a short ramp down to the Fourth and Brannan intersection. This alternative was ruled out by the legislative requirement for a high-level bridge over China Basin.

2. Making a connection from Fourth and Brannan to the Embarcadero Freeway somewhere on the north side of China Basin. The relatively expensive real estate developments on the north side of China Basin, as well as the height of the Embarcadero Freeway viaduct at the point where a connection would be necessary, ruled out this alternative.

3. Making a connection to the Embarcadero Freeway on the south side of China Basin, thereby necessitating a crossing over Channel Street. This alternative was selected although, as is discussed in detail in the legal section of this report, there may be certain legal problems to be clarified before this navigable waterway can be crossed.

This connection requires the construction of an entirely separate elevated structure about 3,500 feet long, as shown in Figure V-8, and which is identified as the "Fourth Street Connection". This connection requires crossings over Channel Street (the waterway extending inland from China Basin) and over railroad yards of the Southern Pacific Company's Third and Townsend passenger depot.

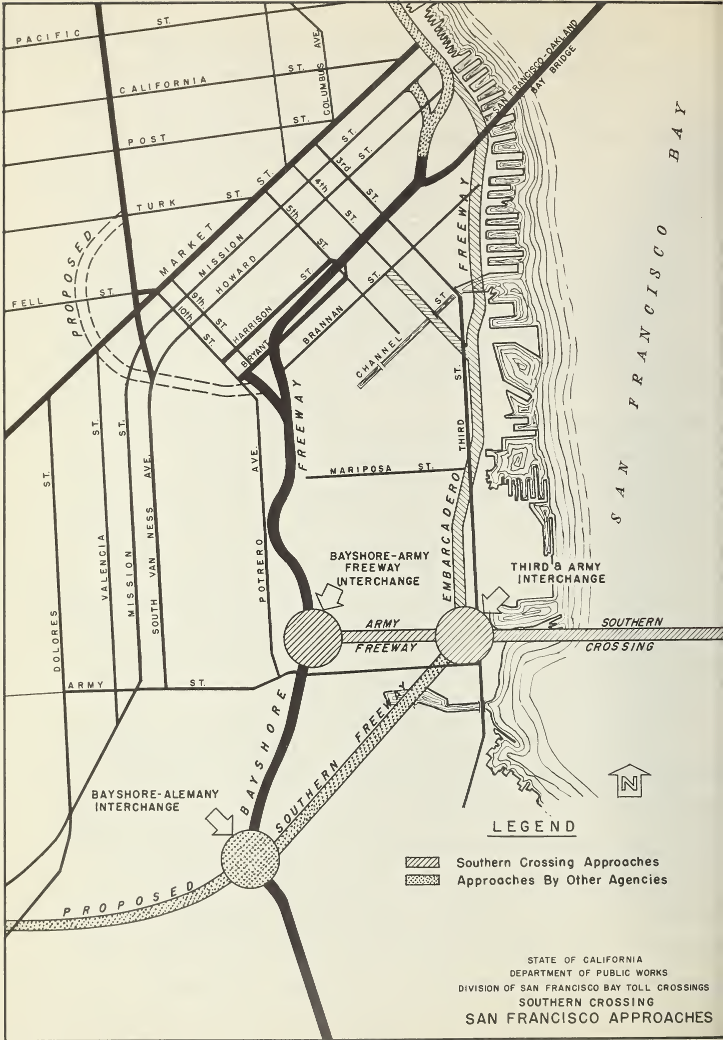
A fixed span with a vertical clearance of 35 feet above M.H.H.W. is planned across Channel Street. This clearance is sufficient only for barges and small harbor vessels. Neither a high-level crossing nor a low-level bridge with a movable span was considered desirable at this location; the first because of the excessively steep grades required to bring the roadway down to Brannan Street; and the latter because of interruption of traffic not only on the connection itself but also on the Embarcadero Freeway which would result from the backing-up of traffic from a drawbridge. An application for a permit to build the low fixed-span bridge has been submitted to the Corps of Engineers, U. S. Army.

The existing single leaf bascule bridge on the surface level of Fourth Street alongside the viaduct will remain in place for the use of local traffic.

The location of the Fourth Street connection across the Southern Pacific yard between Brannan and Channel Streets occupies an area in which it has been planned to build a railroad overhead. This separation structure, which has been the subject of negotiation between the City and the railroad, would carry local southbound traffic over the railroad yards. The structure has been advocated because the surface level of Fourth Street is now frequently blocked by passenger trains.

A grade of about 7.5% is required to make the connection of the on-ramp (southbound) to the intersection of Fourth and Brannan. Since the Fourth and Brannan area is in general a warehouse and light manufacturing district, it can be expected to generate a considerable amount of truck traffic. The conditions which necessitate this 7.5% grade, which is not conducive to truck traffic, are: (1) the short distance between the Southern Pacific yard and Brannan Street, and (2) the clearances (specified by the State Public Utilities Commission) which must be provided over the railroad tracks in the yard. Some railroad relocation work will be required to make this connection to Fourth and Brannan possible.

It is understood that the City of San Francisco plans to designate Brannan Street as one-way westbound, and Fourth Street as one-way southbound. Accordingly, the connection to the Fourth and Brannan intersection is arranged for this type of traffic movement, and this necessitates a reversal of the normal direction of traffic on the viaduct approach. In the event the City fails to adopt these streets as one-way, then the Fourth Street Connection as shown must be revised.



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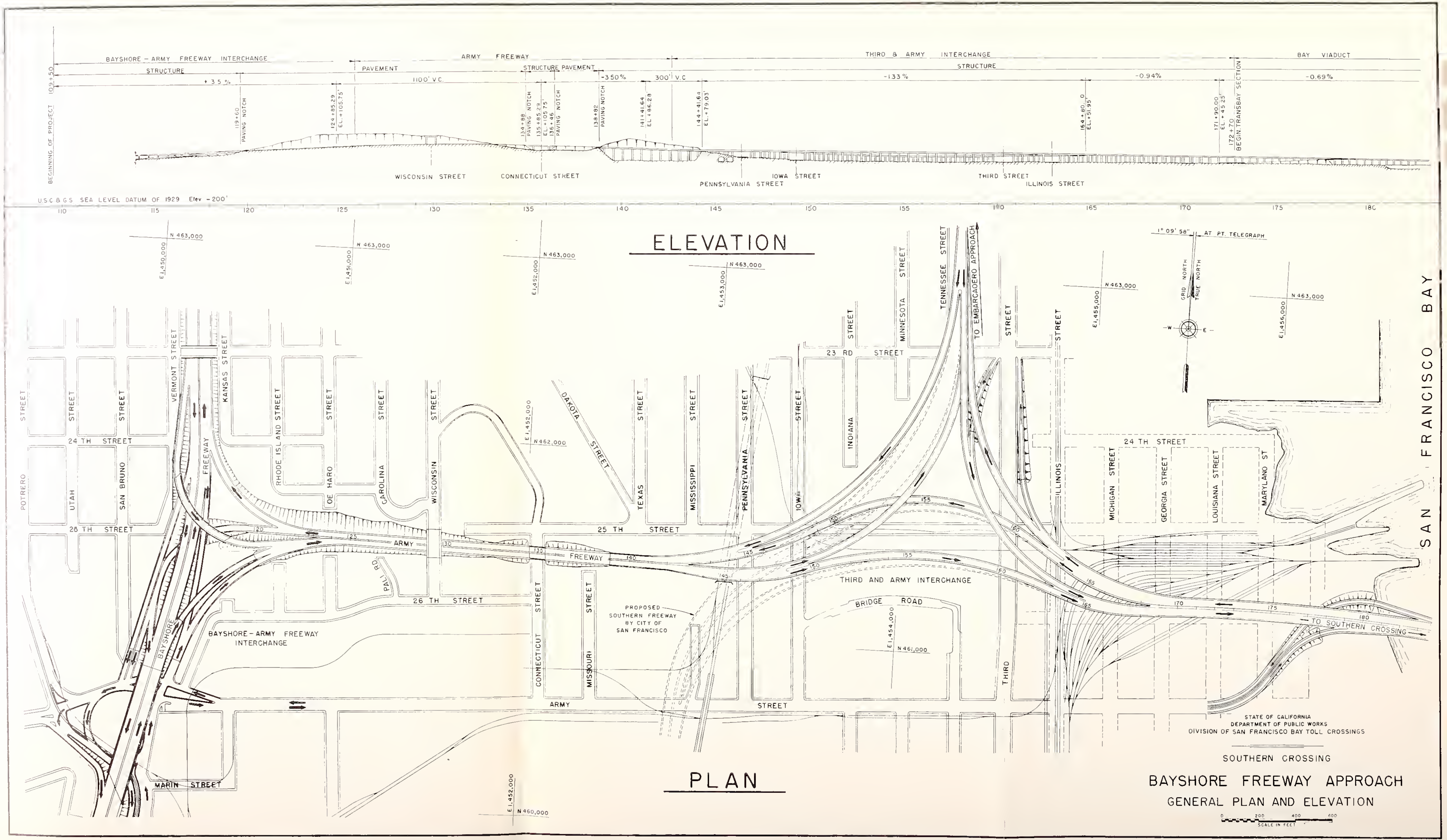
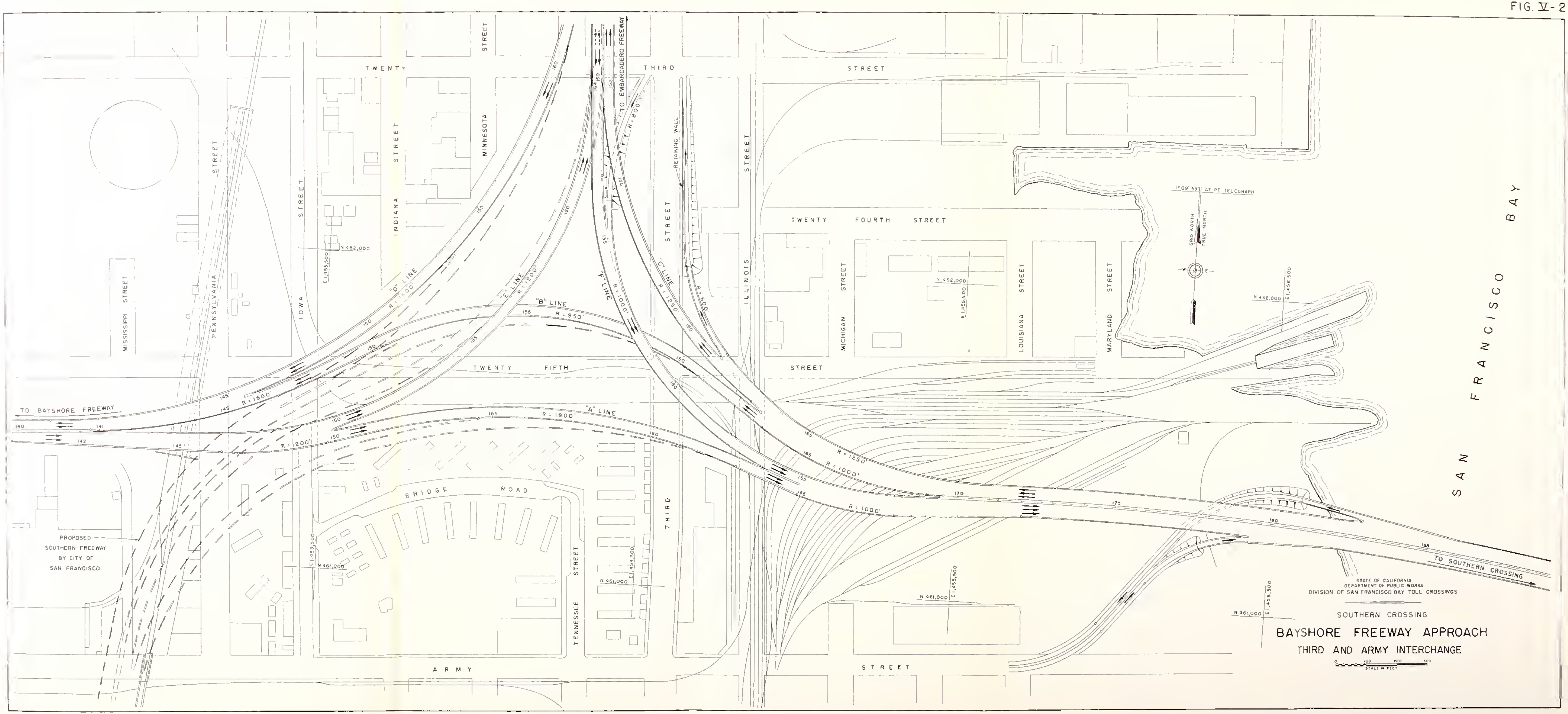
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS
SOUTHERN CROSSING
SAN FRANCISCO APPROACHES



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

BAYSHORE FREEWAY APPROACH
GENERAL PLAN AND ELEVATION



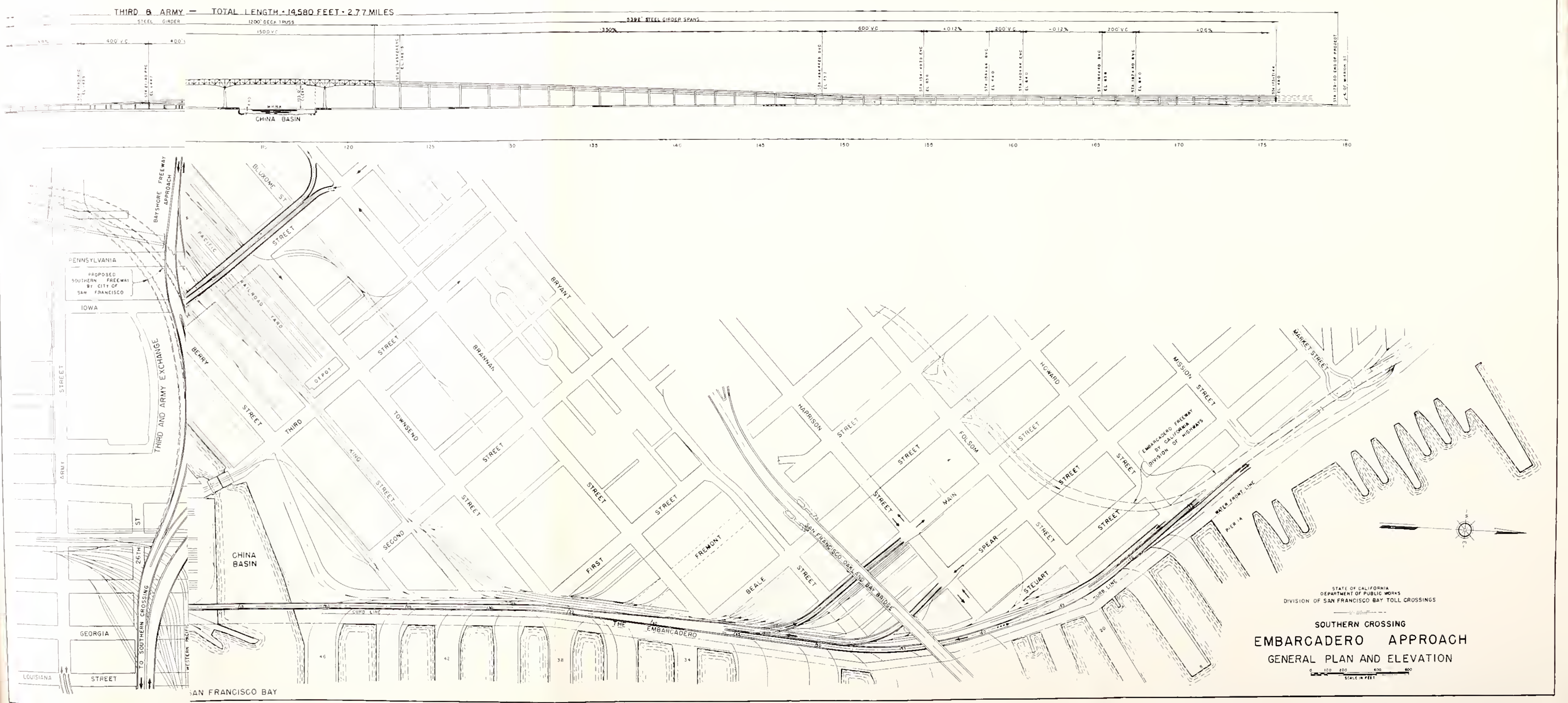
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

BAYSHORE FREEWAY APPROACH

THIRD AND ARMY INTERCHANGE

THIRD & ARMY INTERCHANGE
STEEL GIRDER SPANS
BEGIN EMBARCADERO APPROACH
EMBARCADERO APPROACH — TOTAL LENGTH • 14,580 FEET • 2.77 MILES
7609 STEEL GIRDER SPANS
1200' DECK TRUSS
1500 V.C.
400' V.C.
400' V.C.
+0.31%
200' V.C.
-0.80%
0.80%
600' V.C.
600' V.C.
-0.40%
200' V.C.
+0.10%
500' V.C.
3.50%
STA. 33+69.74
U.S.C. & G.S. S.L. OF 1929 + 0.000
SEA LEVEL DATUM 1929 EL +200.0
CHINA BASIN
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125
130
ELEVATION
BAYSHORE FREEWAY APPROACH
PENNSYLVANIA
STREET
PROPOSED SOUTHERN FREEWAY BY CITY OF SAN FRANCISCO
IOWA
STREET
INDIANA
STREET
MINNESOTA
STREET
TENNESSEE
STREET
THIRD
STREET
ILLINOIS
STREET
MICHIGAN
STREET
MICHIGAN
STREET
GEORGIA
STREET
LOUISIANA
STREET
ARMY
STREET
THIRD AND ARMY EXCHANGE
TO SOUTHERN CROSSING
26TH
ST
WESTERN PACIFIC RAILROAD YARD
TWENTY FIFTH
TWENTY FOURTH ST
TWENTY THIRD
STREET
TWENTY SECOND
STREET
TWENTIETH
STREET
EIGHTEENTH
STREET
MARIPOSA
17TH
SIXTEENTH
SIXTH STREET
STREET
SP
EL DORADO ST
ALAMEDA ST
MERRIMAC ST
A.T. & S.F. RAILROAD YARD
TYPICAL SECTION
FIFTH ST
CHANNEL
SOUTHERN PACIFIC RAILROAD YARD
BLUXOME ST
STREET
CONNECTION
FOURTH STREET
FOURTH STREET
BERRY STREET
HOOPER STREET
IRWIN STREET
THIRD STREET
DEPOT
THIRD
KING STREET
TOWNSEND
STREET
STREET
BRANNAN
SECOND STREET
CHINA BASIN
WATER FRONT LINE
CURB LINE
PIER 48
46
42
SAN FRANCISCO BAY



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DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

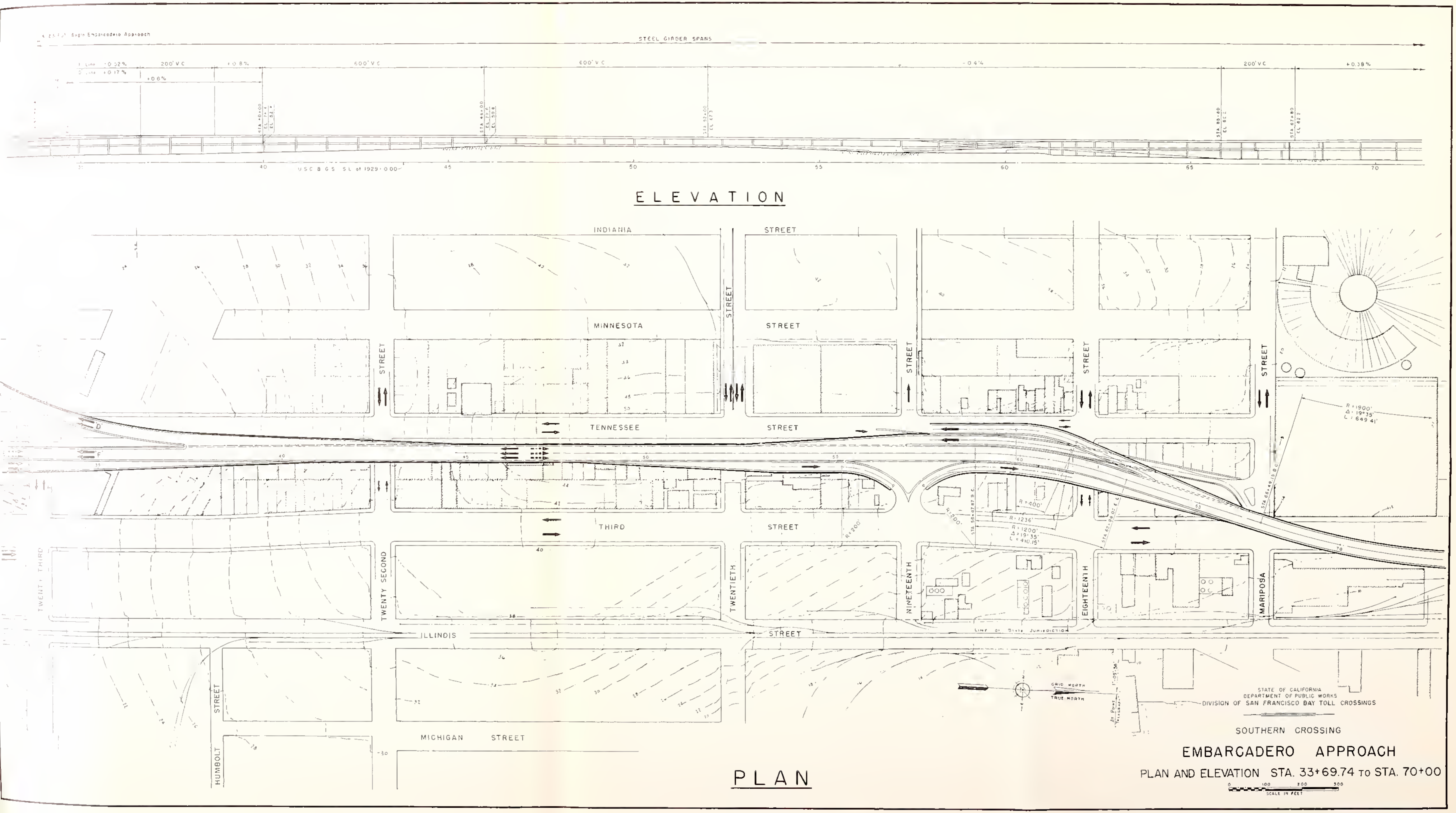
SOUTHERN CROSSING

EMBARCADERO APPROACH

GENERAL PLAN AND ELEVATION

0 100 200 400 600
SCALE IN FEET

FIG. V-4



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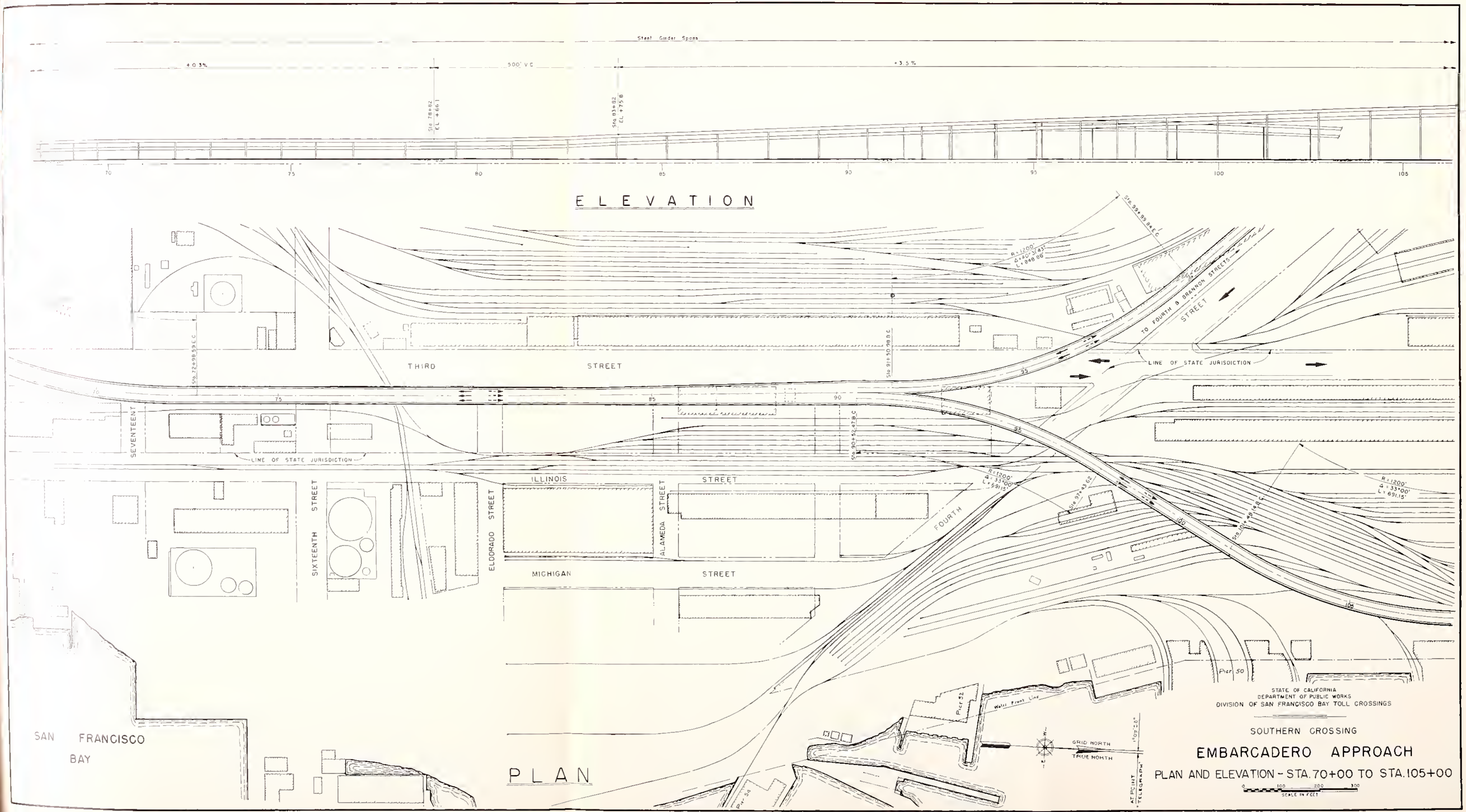
SOUTHERN CROSSING

EMBARCADERO APPROACH

PLAN AND ELEVATION STA. 33+69.74 TO STA. 70+00

0 100 200 300
SCALE IN FEET

FIG. V-5



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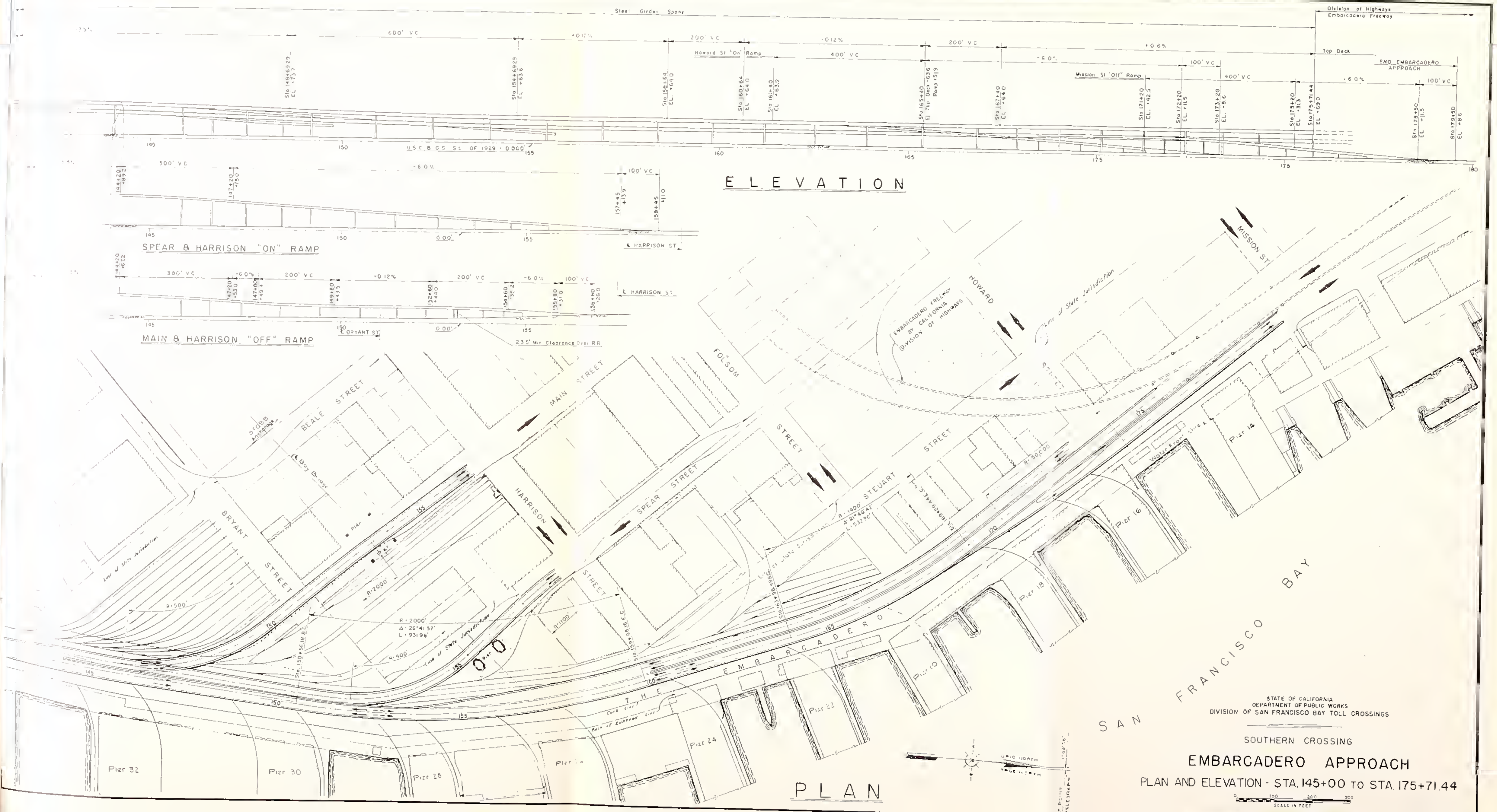
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

EMBARCADERO APPROACH

PLAN AND ELEVATION - STA. 70+00 TO STA. 105+00

FIG. V-7



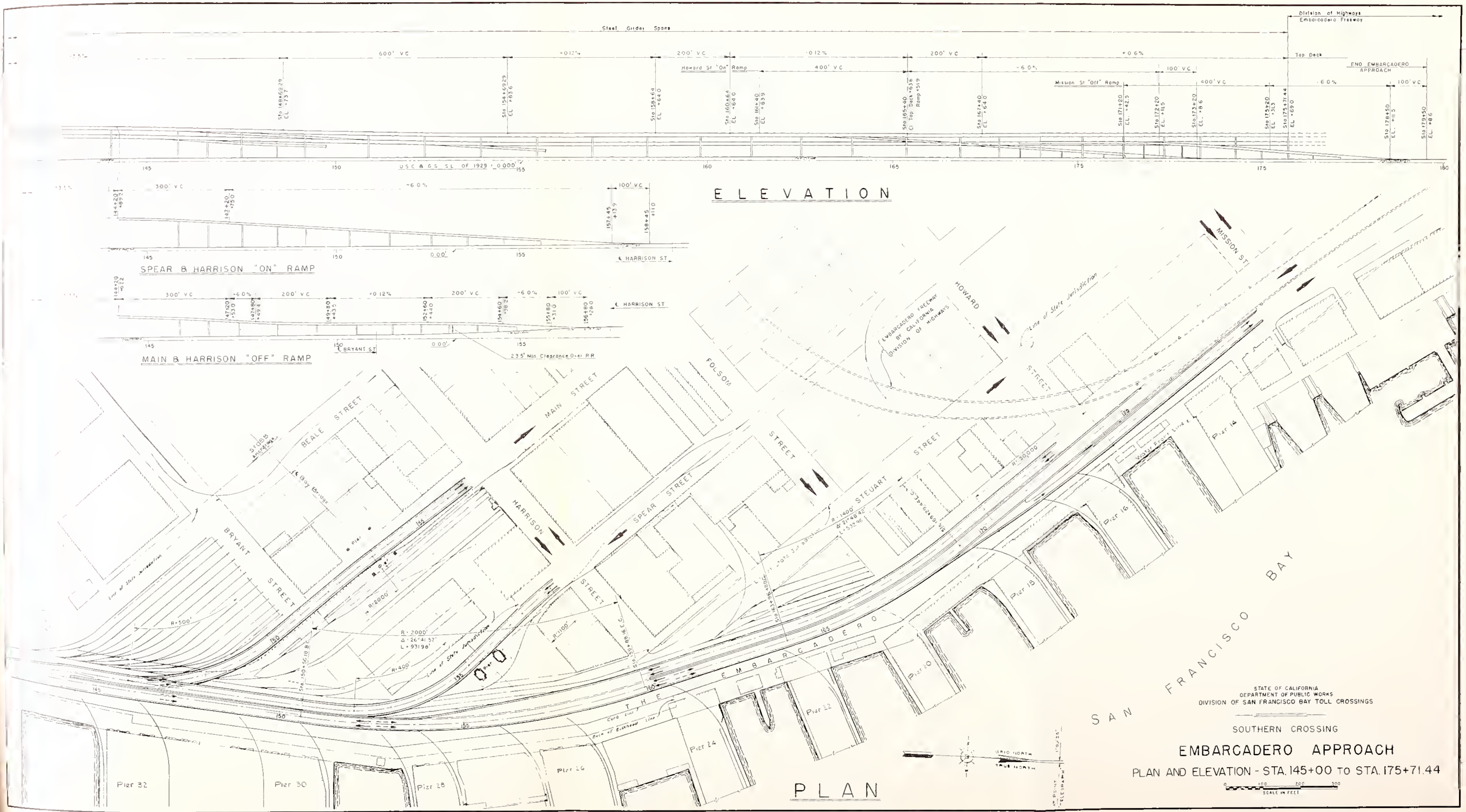
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

EMBARCADERO APPROACH

PLAN AND ELEVATION - STA. 145+00 TO STA. 175+71.44

FIG. V-7



STATE OF CALIFORNIA
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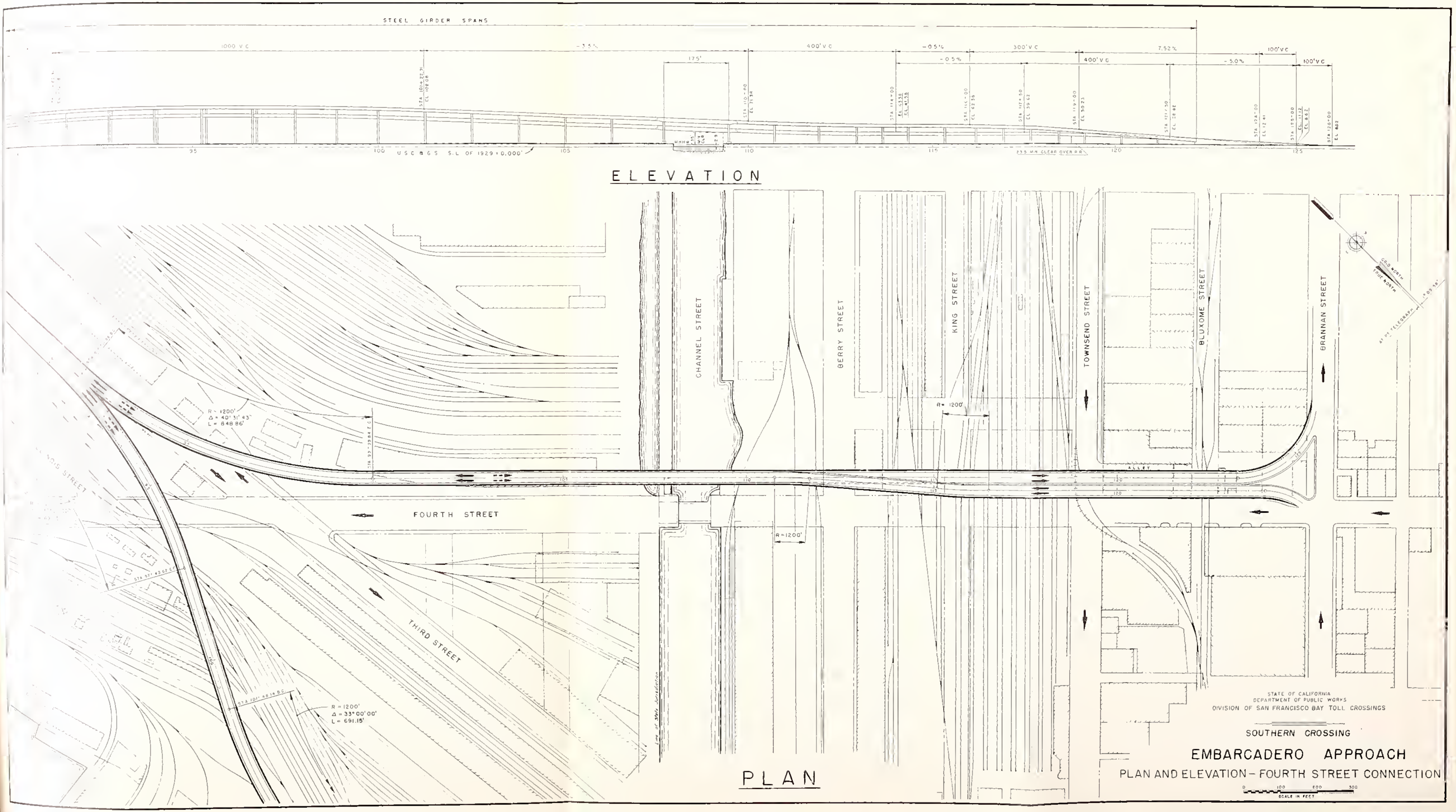
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

EMBARCADERO APPROACH

PLAN AND ELEVATION - STA. 145+00 TO STA. 175+71.44

FIG. V-8



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

EMBARCADERO APPROACH

PLAN AND ELEVATION – FOURTH STREET CONNECTION

PART VI

EAST BAY APPROACHES

The East Bay approach system of the Southern Crossing has been delineated to conform with the wording of the Statutes. This approach system is divided into two main sections: (1) the Eastshore Freeway Approach, and (2) the Alameda Approach.

The Eastshore Freeway Approach (See Figure VI-1.) runs from the bridgehead on Bay Farm Island to a connection with the Eastshore Freeway at Hegenberger Road. It consists of the following components:

(a) The "Bay Farm Island Freeway" between the bridgehead and an interchange at the southern end of the existing Bay Farm Island Bridge.

(b) The "Bay Farm Island Interchange" at the southern end of the existing Bay Farm Island Bridge.

(c) The "San Leandro Bay Freeway" which extends from the Bay Farm Island Interchange to a connection with the Eastshore Freeway at the Hegenberger Road Interchange.

The Alameda Approach (See Figures VI-8 and VI-14.) extends from the north end of the existing Bay Farm Island Bridge westerly along the south shore of Alameda, and thence across Alameda to connections with the existing Posey Tube and with the proposed Webster Street Tube. It consists of the following sections:

(a) The "Southshore Freeway" running across the tidelands along the southern shore of the City of Alameda.

(b) The "Main-Atlantic Freeway" generally paralleling Main Street, Atlantic Avenue, and Webster Street to connections with both the existing Posey and the proposed Webster Street Tubes.

(c) A tube paralleling the existing Posey Tube under the Estuary and connecting with Webster Street in Oakland. This tube will be known as the "Webster Street Tube."

The existing Bay Farm Island Bridge is to be used without major alteration. From a legal point of view it technically is not a part of the Southern Crossing approach system.

EASTSHORE FREEWAY APPROACH

Bay Farm Island Freeway

This Freeway will extend from the bridgehead on the southwesterly shore of the island to the existing Bay Farm Island Bridge and to the proposed interchange of the same name located adjacent thereto. The freeway will be located partly on uplands and partly on tidelands.

This freeway will be six lanes divided and will be about one mile long. It is to be built on hydraulic fill immediately to the west of Maitland Drive, which will continue in service as a frontage road for local residents.

The interchange with Mecartney Road (formerly designated as Kilkenny Road) will be of the simple diamond type, with the freeway carried over Mecartney Road. (See Figure VI-2.)

Bay Farm Island Interchange

This interchange, located at the northwesterly shore of the island, will directly interconnect the existing Bay Farm Island Bridge, the Bay Farm Island Freeway, and the San Leandro Bay Freeway. It will distribute transbay traffic to the East Bay approach system and will also carry local traffic traveling between Alameda and Bay Farm Island. Numerous trial layouts of this interchange were made. The one selected as best serving the major portion of traffic is shown on Figure VI-3.

Traffic movements between the Southern Crossing and the San Leandro Bay Freeway through the interchange will be of a direct type, since it is anticipated that the major Southern Crossing traffic movement will be to the south rather than to Alameda. The movements to and from Alameda will be somewhat more indirect, since the existing Bay Farm Island Bridge must be used. This Bridge was not constructed to "freeway standards," that is, it has relatively short radius curves with restricted sight distances, a movable span, and is accessible to pedestrians. These factors limit operating speeds for Alameda traffic to 30-35 miles per hour.

The Bay Farm Island Bridge was constructed by the Division of Highways in accordance with a Department of the Army instrument of approval dated March 31, 1950. The horizontal clearance now provided with the single bascule leaf is 92 feet. However, the design contemplates future conversion into a double leaf bascule span of 200 feet clear opening if and when the channel between San Leandro Bay and San Francisco Bay is developed for ocean-going vessels.

It should be noted that the future ship channel at this point might result in frequent openings to permit the passage of ocean-going vessels, thereby impairing the usefulness of the Alameda approaches to the Southern Crossing.

Since a sidewalk is provided on the existing Bay Farm Island Bridge, a structure will be built to provide for pedestrian movement across the interchange to get to Maitland Drive.

All schemes studied require the acquisition of a considerable amount of right of way from the Alameda Municipal Golf Course.

San Leandro Bay Freeway

This freeway extends on entirely new alignment from the Bay Farm Island Interchange to a connection with the Eastshore Freeway at the existing Hegenberger Road Interchange. It runs easterly along the north shore of Bay Farm Island paralleling Doolittle Drive, and thence across the tidal mud flats at the east end of San Leandro Bay paralleling Hegenberger Road to its connection with Eastshore Freeway. See Figures VI-4 to VI-7 inclusive.

It will be a four-lane divided freeway, with provisions for ultimate widening to six lanes. Doolittle Drive and Hegenberger Road will be utilized as frontage roads for local traffic to the Alameda Municipal Golf Course, Naval Air Reserve installations, the Oakland Airport, and adjacent industrial plant sites.

On-ramps and off-ramps will connect with these frontage roads. New ramps will be constructed at the Hegenberger-Eastshore Freeway Interchange to handle the various traffic movements as shown on Figure VI-7.

A future freeway generally paralleling the Eastshore Freeway, possibly following Doolittle Drive to Hayward, has been suggested when and if the volume of traffic on the

Eastshore Freeway exceeds the capacity. Therefore, provisions have been made for a future freeway connection to, or extension of, the San Leandro Bay Freeway in the vicinity of the intersection of Doolittle Drive, Hegenberger Road, and Jones Avenue. The freeway lanes spread apart at this point to facilitate the construction of a future interchange, as shown on Figure VI-6.

The somewhat circuitous alignment of the San Leandro Bay Freeway is required to avoid two major obstacles, namely (1) the Metropolitan Oakland International Airport, and (2) San Leandro Bay, a navigable waterway and future harbor area of the Port of Oakland.

In the area north and west of the proposed freeway, that is, the navigable waters and tidal flats of San Leandro Bay, a harbor development is planned by the Port of Oakland. This development involves deep water harbor facilities including a 1500-foot-radius ship turning basin, about 3-1/2 miles of wharves with transit sheds, and adjacent industrial sites with streets, railroad spur tracks and switching yards. Even without this planned harbor development, with only the present navigation channel to be crossed, a route across San Leandro Bay would be costly and would offer inferior traffic service. A high-level crossing at this location would not be practical because of proximity to the airport. A low-level crossing with a movable span would involve periodic interruption to vehicular traffic. A subaqueous tube crossing is not considered because of the inherent cost. Therefore, it was concluded that a direct connection across San Leandro Bay is impractical.

The area south of the proposed freeway is occupied by the Metropolitan Oakland International Airport. A route through this installation would be impractical for obvious reasons.

Prior to World War II Maitland Drive extended along the south shore of Bay Farm Island and along the south edge of the present airport to the extension of Jones Avenue. A freeway along the south shore of Bay Farm Island and along the general line formerly followed by Maitland Drive would be situated between the present airport and the future offshore runway. It would be necessary to depress the freeway beneath a surface taxiway which will connect the existing airport and the new runway. East of the airport the freeway would require a railroad separation and additional highway interchange facilities to connect with the Eastshore Freeway. Although this route would be more direct for traffic traveling to and from the south leg of the Eastshore Freeway, it would be more costly than the proposed San Leandro Bay Freeway.

The master plan for the Oakland Airport contemplates the eventual construction of an access road skirting the south and west boundaries of the present airport.

A route around the northwest shore of San Leandro Bay, although affording the most direct connection to the Eastshore Freeway, would necessarily begin at the north end of the existing Bay Farm Island Bridge, and, therefore, would not correspond with the wording or the apparent intent of the Statutes.

Practically all of the right of way required for the San Leandro Bay Freeway must be acquired from the cities of Alameda and Oakland.

ALAMEDA APPROACH

Southshore Freeway (See Figures VI-8 to VI-11 inclusive.)

The Statutes specify a freeway "along the southerly shore of the City of Alameda from Bay Farm Island Bridge to the southerly prolongation of Main Street . . ." and with a connection to the south end of Webster Street. This approach would be built as a hydraulic mole fill in shallow tidal waters, immediately offshore from the existing tideland lot line. The City of Alameda has agreed to reserve for highway purposes a strip of City-owned tidelands along the south shore.

The Southshore Freeway is designed as a four-lane divided highway.

The interchange at the north end of the existing four-lane Bay Farm Island Bridge allows off-movements from the bridge to city streets and on-movements to the bridge only. Internal traffic traveling between the two ends of the City of Alameda must use city streets. (See Figure VI-9.)

The connection from the Southshore Freeway to the southern end of Webster Street goes directly through and bisects the property now owned by the U. S. Maritime Service and which was used during World War II as an officers' school. This school is now inactive. (See Figure VI-10.)

An application for a permit to construct the mole fill for the Alameda Southshore Freeway was submitted to the Department of the Army on September 27, 1954. Since this enire fill would be located on the shoreward side of the stablished combined pierhead-bulkhead line, the Corps of

Engineers, U. S. Army, returned the application on October 5, 1954, and advised this Division that ". . . a Department of the Army permit is not necessary for the proposed fill. . ." However, Army approval will be required for the disposal of any unsuitable material which might be dredged from along the line of the proposed Freeway.

Main-Atlantic Freeway

The freeway across Alameda follows Main Street and Atlantic Avenue and is four lanes divided. Connections with city streets are made in the vicinity of the intersections of (1) Main and Atlantic, and (2) Webster and Atlantic. Traffic data indicates that this freeway will probably not carry as much through traffic as Webster Street.

The freeway extending along Main Street and its prolongation will require the acquisition of a strip of land along and inside the easterly boundary of the Naval Air Station. This may require Congressional action. Any alternative alignment would cut through or in front of the new Encinal High School. The layouts shown in this report assume that the needed right of way can be obtained from the Navy. (See Figures VI-11 and VI-12.)

The portion of this freeway extending from Main to Webster Street will be located along the route now followed by the Alameda Belt Line and Atlantic Avenue. (See Figures VI-12 and VI-13.) It will be about 4200 feet long. Practically all of the right of way in this area must be taken from various government housing projects, as follows:

Western Project No. 4820 and Woodstock Project in vicinity of the Main-Atlantic intersection; Naval Air Station Civilian Housing Project on the north side of Atlantic Avenue; Chipman Project on the south side of Atlantic; and Webster Project No. 4118 along Webster Street.

The new Woodstock Elementary School is located at the intersection of Third Street and Atlantic Avenue, and serves areas on both sides of Atlantic. It appears that this school will not have to be moved to make room for the Southern Crossing approach. However, a pedestrian bridge or underpass for school children crossing the freeway must be provided.

The Alameda Belt Line is controlled by the Atchison, Topeka and Santa Fe Railway Company. There has been some discussion in the past by City of Alameda and Naval Air Station officials of the possibility of abandoning that portion of the Alameda Belt Line which extends between Webster Street and the Naval Air Station and which parallels Atlantic Avenue. This proposal would require that all rail movements into the Naval Air Station be made via the existing Southern Pacific tracks which follow Main Street and the Oakland Estuary. As of the date of this writing, the future operation of the Belt Line in this vicinity had not been determined. If this rail line can be removed, it will simplify the right of way problem, and in addition will eliminate the need for a costly structure to carry the Freeway over or under the rail line.

However, for the purposes of this report it has been assumed that the rail line must remain in place. It is considered uneconomical to either elevate or depress the rails to carry them over or beneath the Freeway because of the length of approach ramps required. The tentative layout shown in Figure VI-12 indicates one method of carrying the Freeway over the rail line at a proposed relocated position.

Webster Street Tube

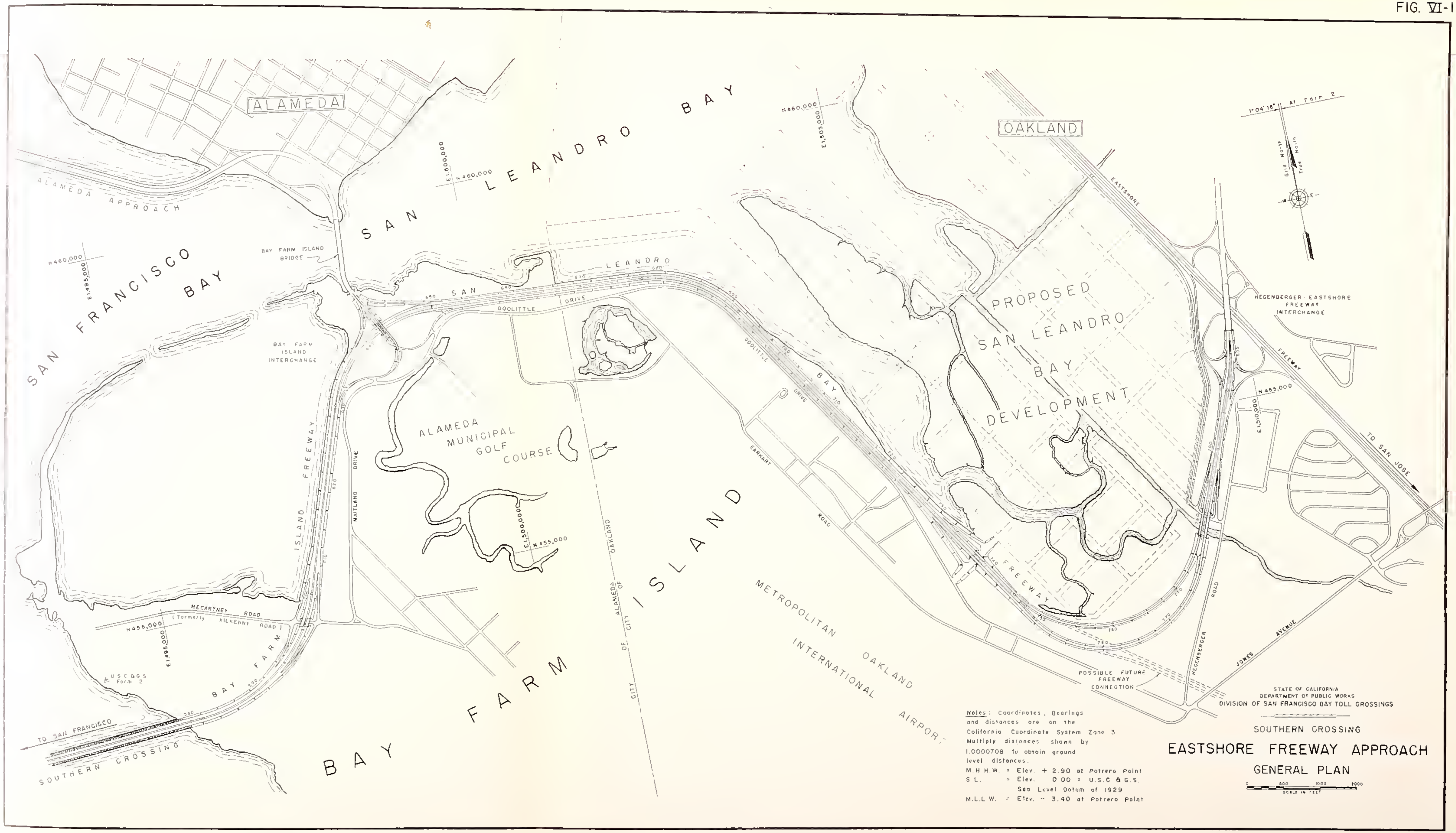
This connection between Alameda and Oakland will be a new two-lane vehicular tube beneath the Oakland Estuary. It will be located approximately one block west of the existing two-lane Posey Tube and will connect with Webster Street in Oakland. This Webster Street Tube will be operated one-way southbound from Oakland to Alameda and the present Posey Tube one-way northbound from Alameda to Oakland. (See Figure VI-14.)

Chapter 1056 of the Statutes of 1953 provided that the proposed Webster Street tube was to be financed and built as an approach to the Southern Crossing. However, local interests, desiring to expedite the construction of the tube, have requested that the tube be financed from State Highway funds.

In accordance with this request a special appropriation of $500,000 to initiate acquisition of rights of way for the new Estuary tube was voted by the California State Highway Commission on August 27, 1954. However, the Commission stated this action was ". . . taken without prejudice to any other method of financing in the future."

Since construction of the tube may be undertaken by the Division of Highways, and since the tube has been fully described in previous reports of this Division, a detailed discussion is omitted here. This Division is cooperating with the Division of Highways to ensure that adequate connections may be made between the Alameda approach to the new tube and the proposed Main-Atlantic Freeway.

FIG. VI-1



Notes: Coordinates, Bearings and distances are on the California Coordinate System Zone 3
Multiply distances shown by 1.0000708 to obtain ground level distances.
M.H.H.W. = Elev. + 2.90 at Potrero Point
S.L. = Elev. 0.00 = U.S.C.&G.S. Sea Level Datum of 1929
M.L.L.W. = Elev. − 3.40 at Potrero Point

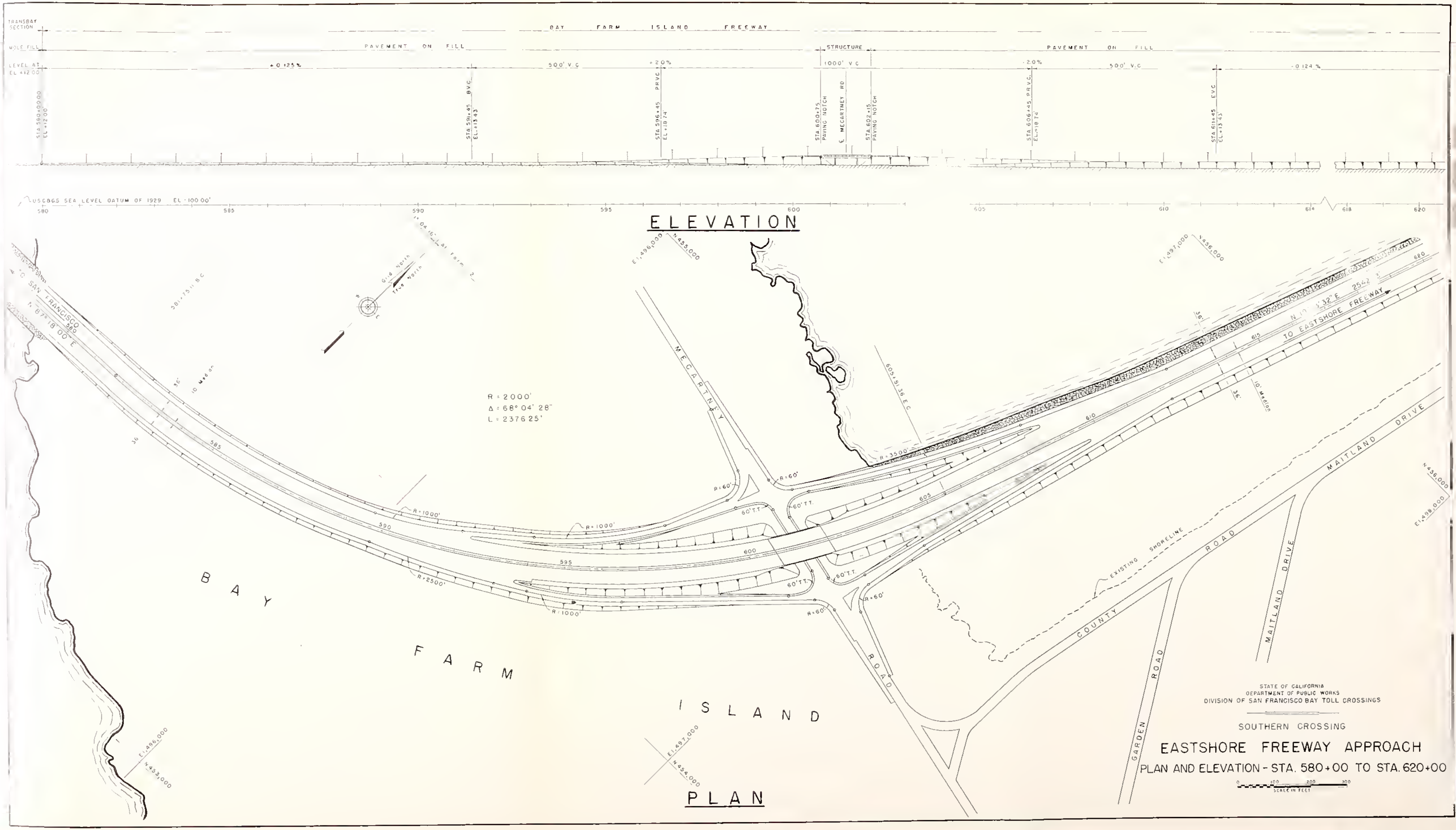
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

EASTSHORE FREEWAY APPROACH

GENERAL PLAN

FIG. VI-2



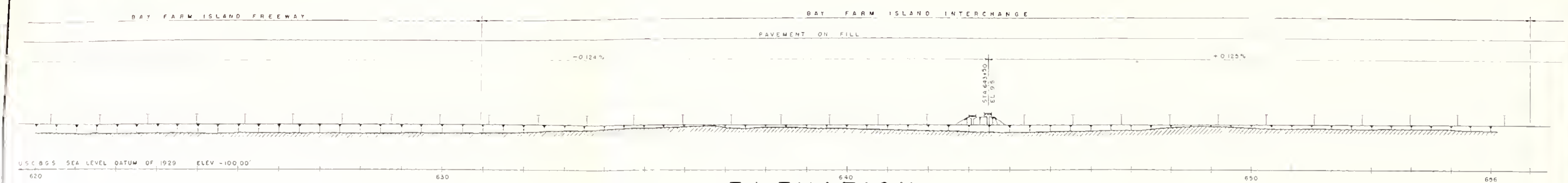
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

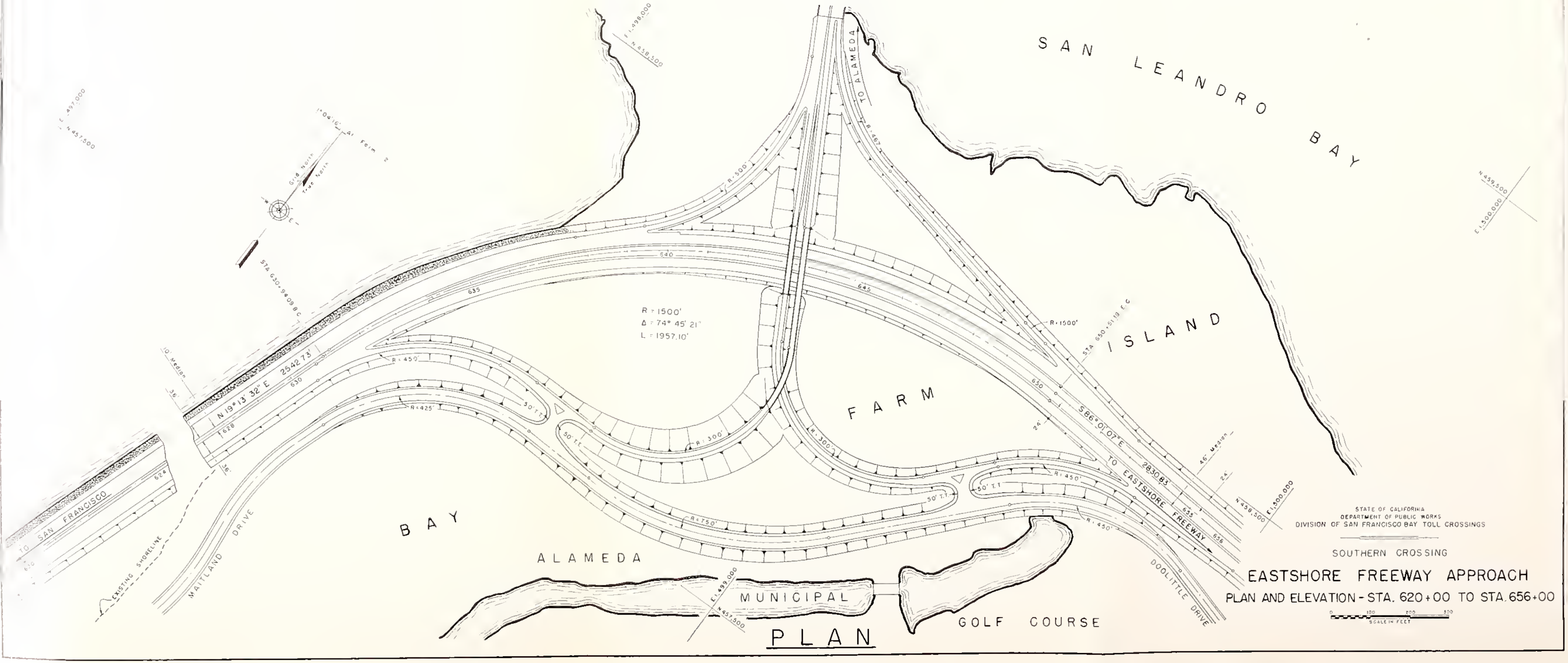
EASTSHORE FREEWAY APPROACH

PLAN AND ELEVATION - STA. 580+00 TO STA. 620+00

FIG. VI-3



ELEVATION



PLAN

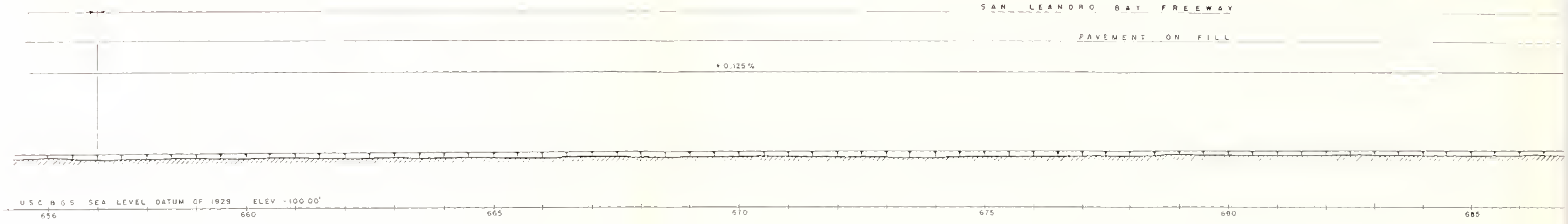
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

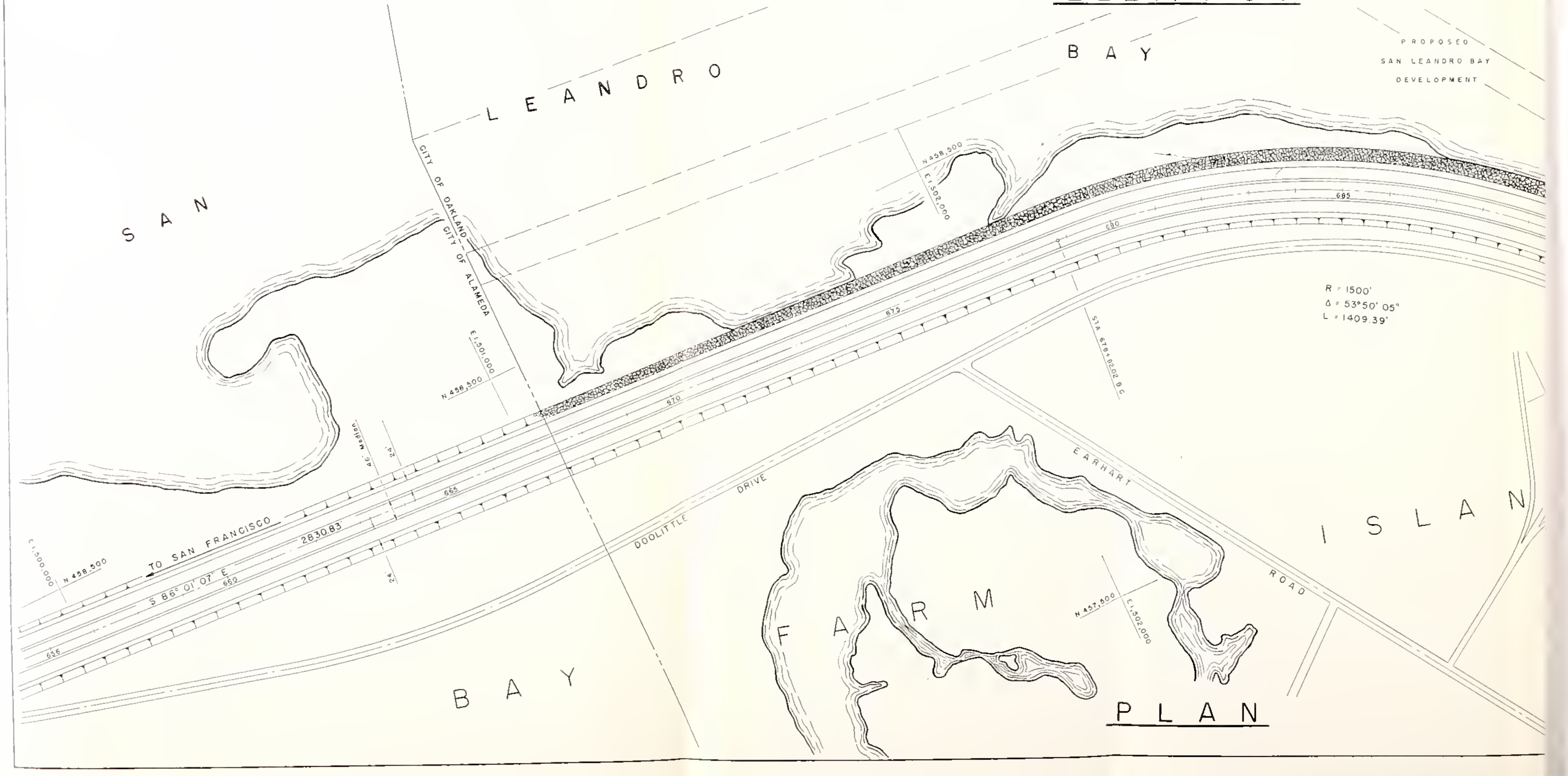
EASTSHORE FREEWAY APPROACH

PLAN AND ELEVATION - STA. 620+00 TO STA. 656+00

0 100 200 300
SCALE IN FEET

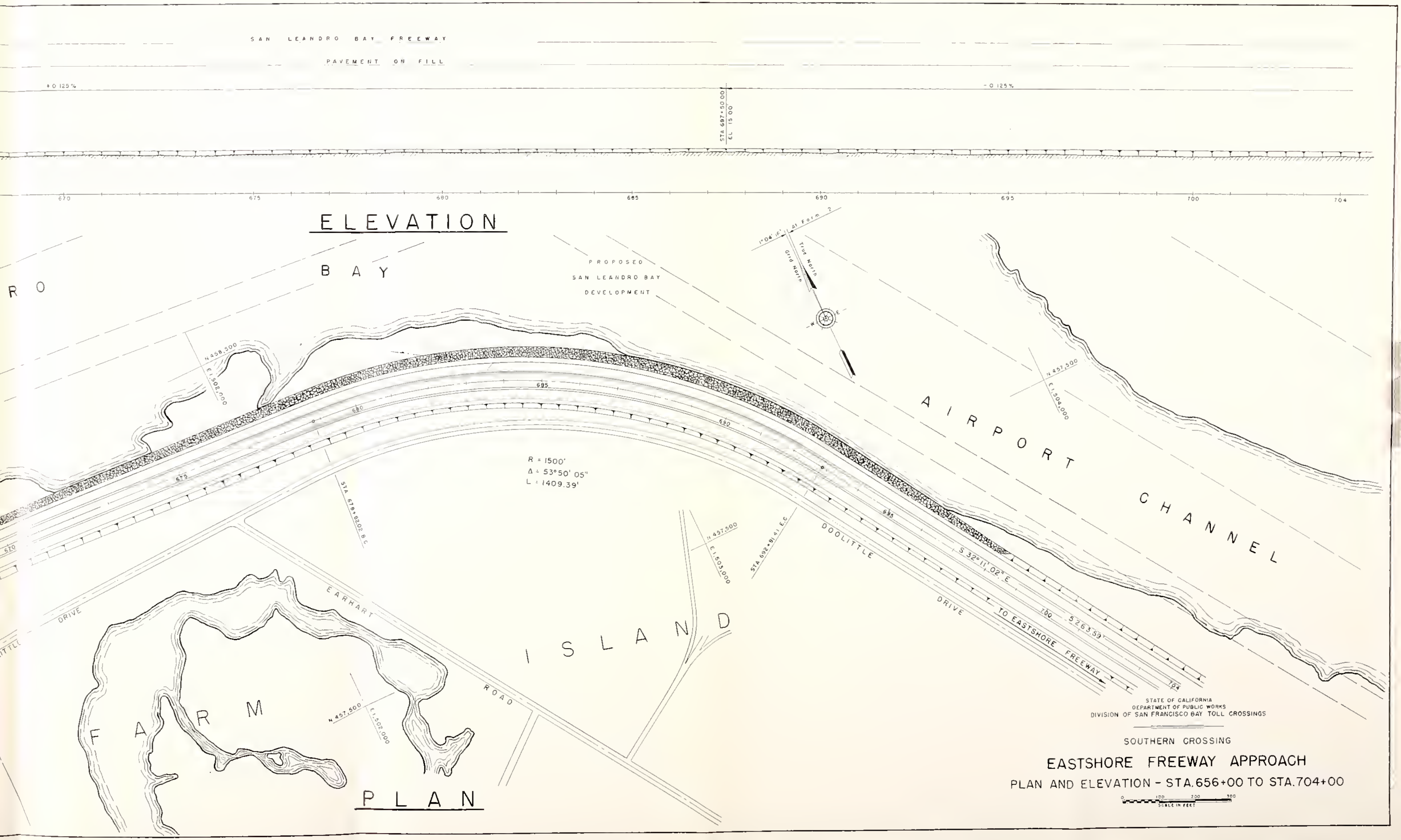


ELEVATION



PLAN

FIG. VI-4



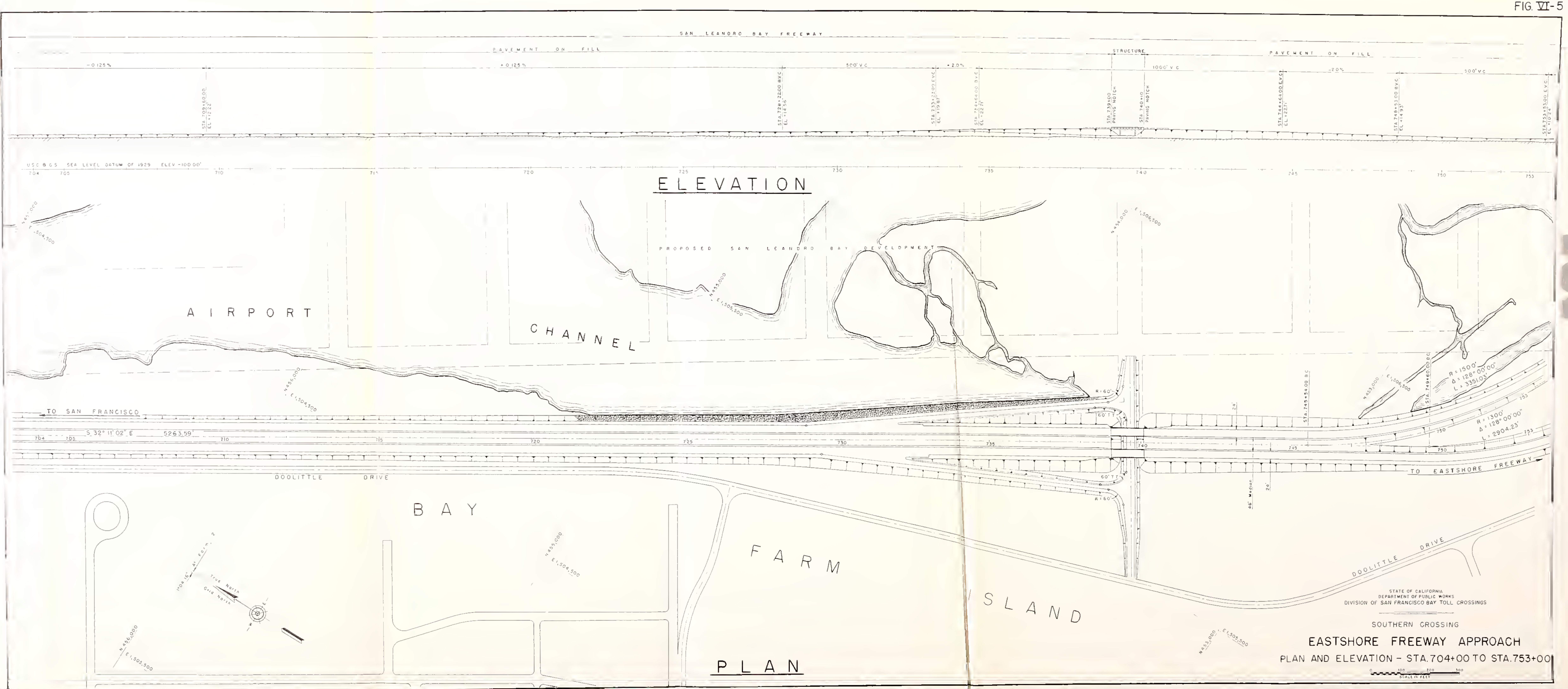
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

EASTSHORE FREEWAY APPROACH

PLAN AND ELEVATION - STA. 656+00 TO STA. 704+00

FIG. VI-5

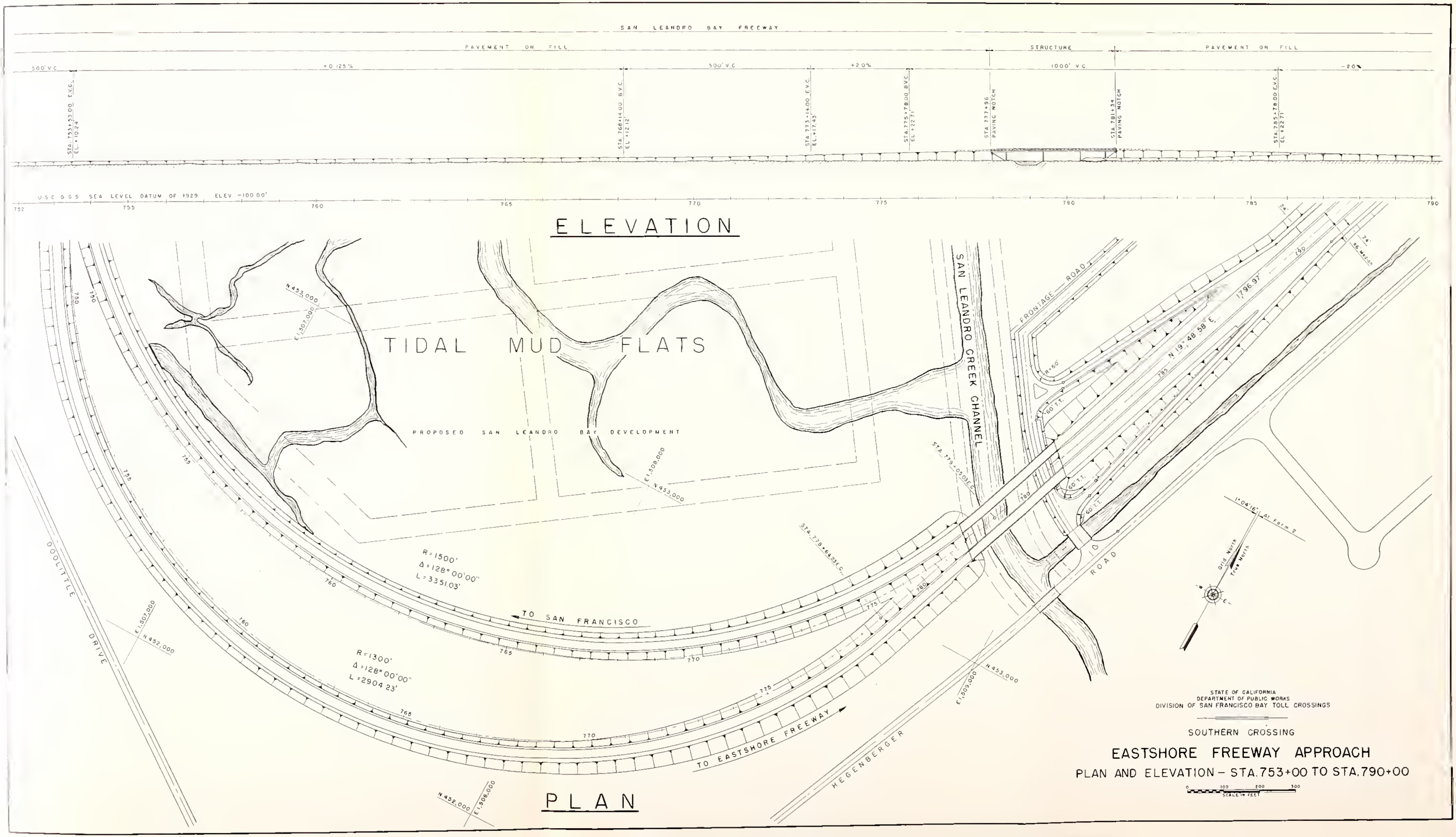


STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

EASTSHORE FREEWAY APPROACH
PLAN AND ELEVATION - STA. 704+00 TO STA. 753+00

FIG. VI-6



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

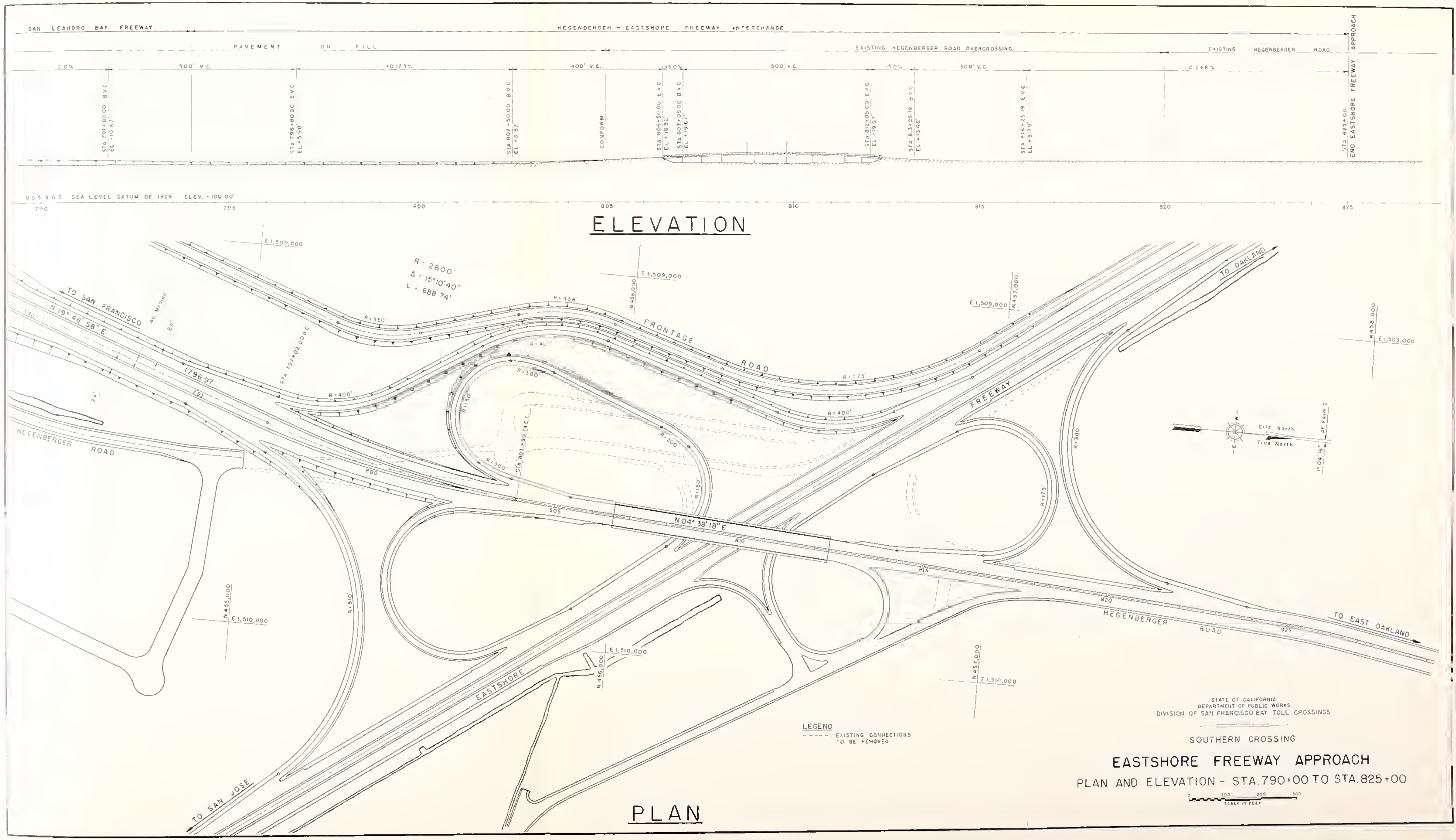
SOUTHERN CROSSING

EASTSHORE FREEWAY APPROACH

PLAN AND ELEVATION – STA. 753+00 TO STA. 790+00

0 100 200 300
SCALE IN FEET

FIG. VI-7



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

EASTSHORE FREEWAY APPROACH

PLAN AND ELEVATION - STA. 790+00 TO STA. 825+00

NOTE

Coordinates, bearings, and distances shown are on the California Coordinate System, Zone 3. Multiply distances shown by 1.0000708 to obtain ground level distances

MHHW = El +2.90 at Potrero Point
SL = El 0.00 = U.S.C.&G.S. Sea Level Datum of 1929
MLLW = El -3.40 at Potrero Point

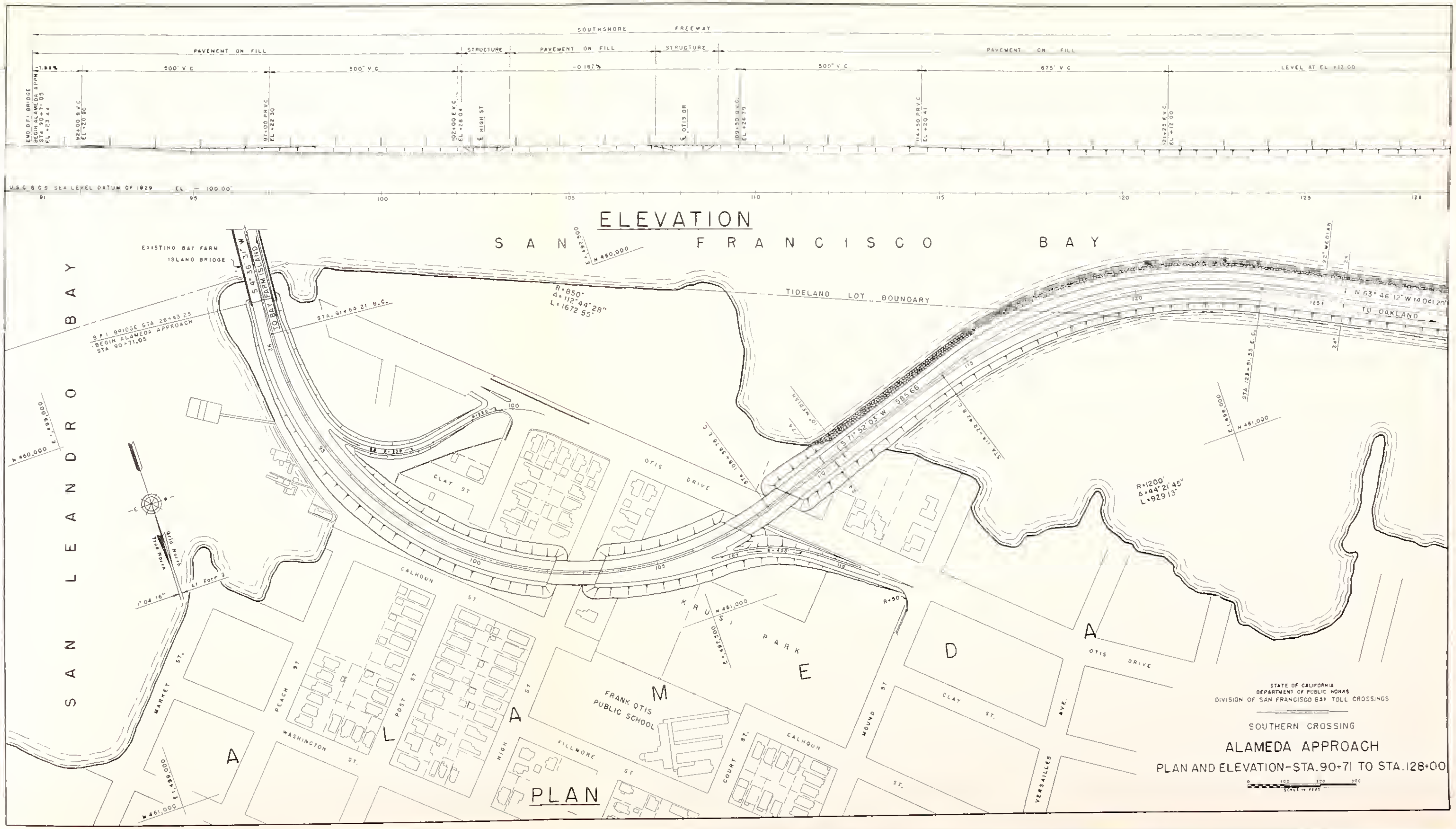
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

ALAMEDA APPROACH

GENERAL PLAN

SCALE IN FEET

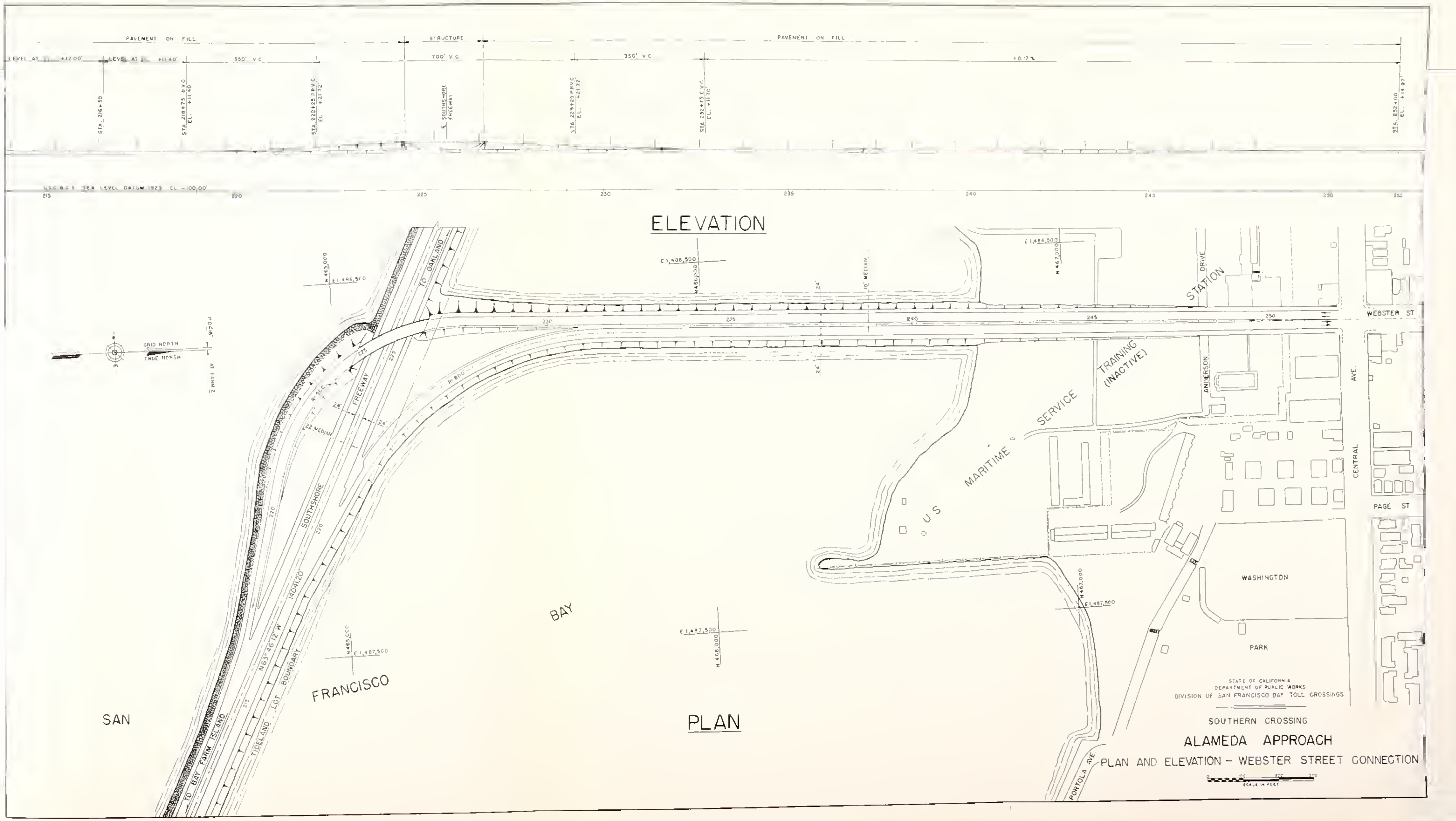


STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

ALAMEDA APPROACH

PLAN AND ELEVATION–STA.90+71 TO STA.128+00



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

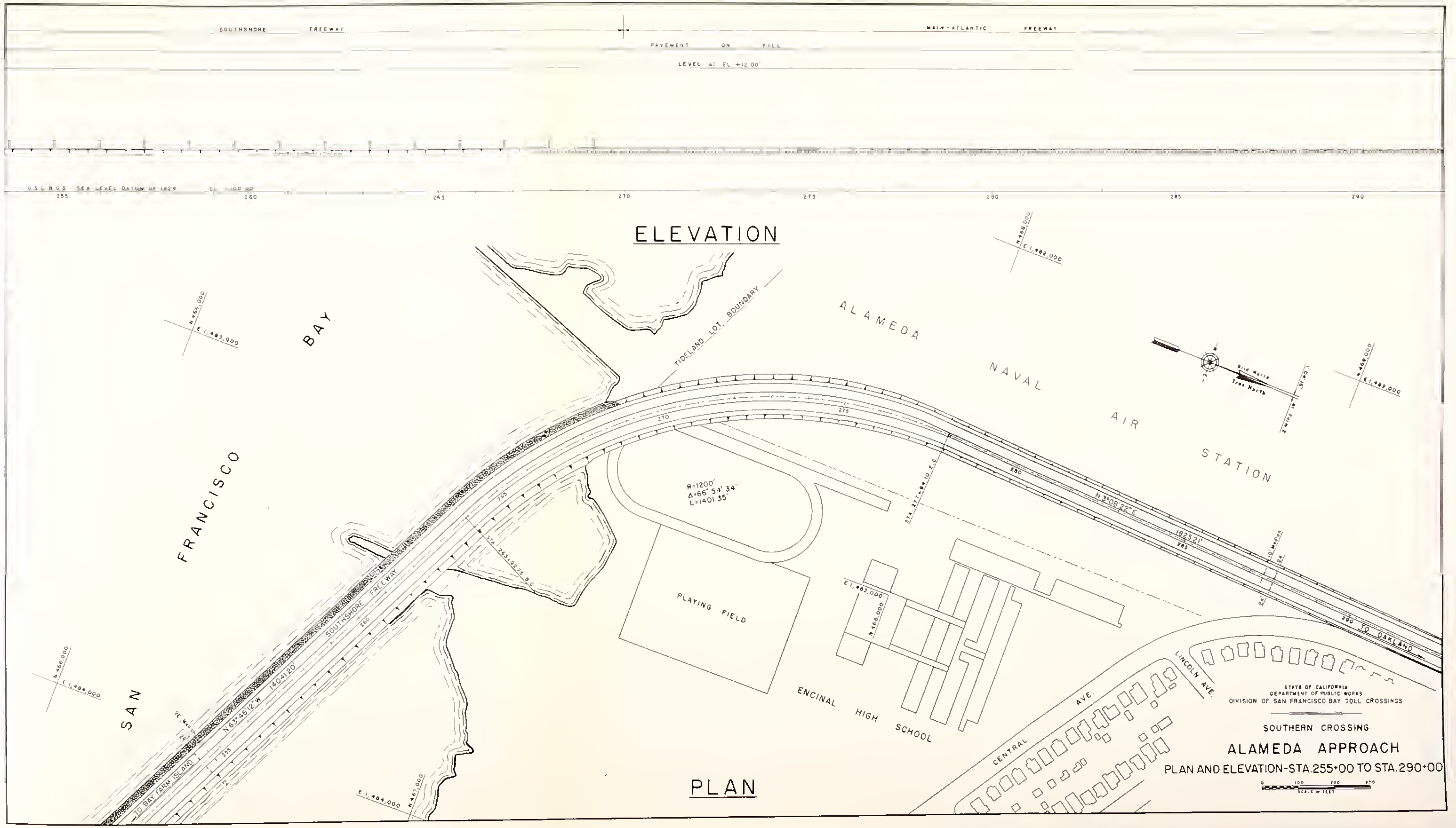
SOUTHERN CROSSING

ALAMEDA APPROACH

PLAN AND ELEVATION – WEBSTER STREET CONNECTION

0 100 200 300
SCALE IN FEET

FIG. VI-11

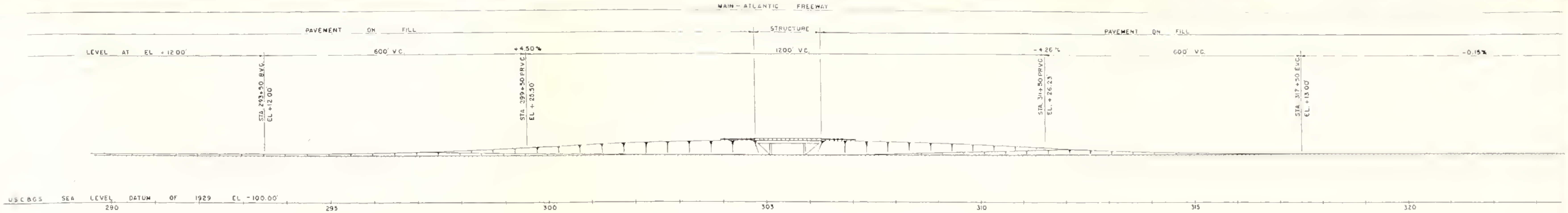


STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

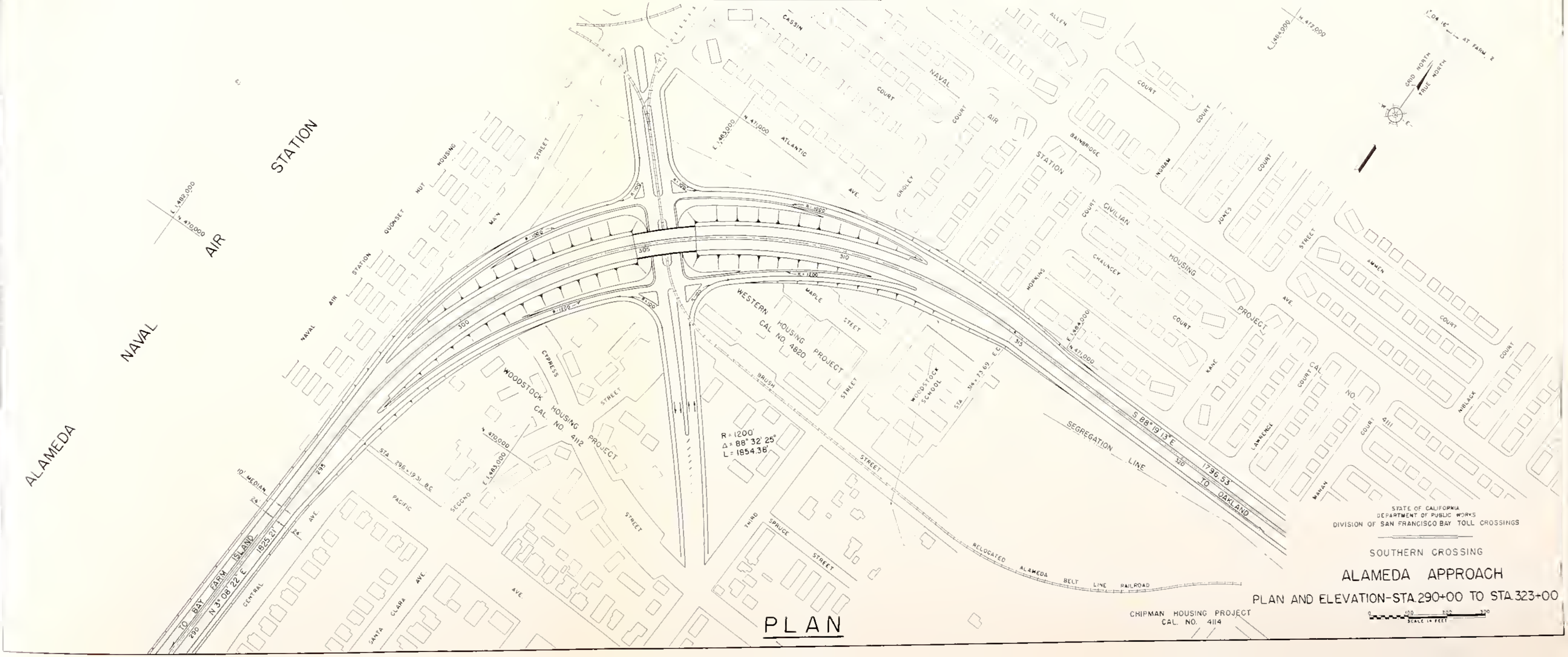
SOUTHERN CROSSING

ALAMEDA APPROACH

PLAN AND ELEVATION-STA.255+00 TO STA.290+00


MAIN – ATLANTIC FREEWAY
PAVEMENT ON FILL
STRUCTURE
PAVEMENT ON FILL
LEVEL AT EL +12.00'
600' V.C.
+4.50%
1200' V.C.
-4.26%
600' V.C.
-0.15%
STA. 293+50 B.V.C. EL +12.00'
STA. 299+50 P.R.V.C. EL. + 25.50'
STA. 311+50 P.R.V.C. EL. + 26.23'
STA. 317+50 E.V.C. EL. +13.00'
U.S.C.&G.S. SEA LEVEL DATUM OF 1929 EL -100.00'
290
295
300
303
310
315
320

ELEVATION



CHIPMAN HOUSING PROJECT
CAL. NO. 4114

PLAN

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF SAN FRANCISCO BAY TOLL CROSSINGS

SOUTHERN CROSSING

ALAMEDA APPROACH

PLAN AND ELEVATION–STA. 290+00 TO STA. 323+00

0 100 200 300
SCALE IN FEET

PART VII

FINANCIAL

Sections 30656, 30657, and 30658 of the Streets and Highways Code (See Appendix A) provide for financing the Southern Crossing and its approaches through the issuance of revenue bonds, to be supported by the combined net revenues from both the San Francisco-Oakland Bay Bridge and the Southern Crossing.

Section 30658 also directed the California Toll Bridge Authority to investigate the possibility of financing the proposed crossing by means of a loan to be obtained from the Federal Reconstruction Finance Corporation. Accordingly, the Director of Public Works wrote the RFC on July 6, 1953, to explore this possibility. The RFC reply, contained in a letter dated July 13, 1953, stated in part as follows:

> ". . . it is necessary to advise you that the Corporation would be unable to make a loan for the purpose desired or in the amount required by the California Toll Bridge Authority to finance the construction of its proposed project at this time."

It is now planned to confine the future financial study to the usual method of revenue bond financing for which provisions are made in the California Toll Bridge Authority Act, and which has been used heretofore for the following projects: Purchase of Carquinez and Antioch Bridges, refinancing of San Francisco-Oakland Bay Bridge, purchase of San Mateo-Hayward and Dumbarton Bridges, and construction of Richmond-San Rafael Bridge.

It is not planned to investigate alternative means of financing, such as general obligation bonds, since there is at present no legal authorization for this type of borrowing.

No grants, appropriations, interest-free loans, or other funds are assumed to be available to assist in the financing. No supplemental security, such as a district property tax or state credit, is anticipated to insure debt service in the event revenues prove insufficient. Fortunately, the record of earnings of the San Francisco-Oakland Bay Bridge is sufficiently long and sound to establish a good credit rating, and it is this rating which will determine the maximum amount of money that can be borrowed for the proposed new crossing.

Factors To Be Considered

Consideration must be given to the following factors in connection with the Southern Crossing financial study. Some of these factors were not present when the previous studies were made by this Division.

(a) Effect of change in the Statutes requiring maintenance expenses to be paid out of toll revenues instead of from the State Highway Fund, as had been the previous practice.

(b) Future of the Bridge Railway, and the possibility of having to finance from a new bond issue the cost of a vehicular deck to replace the Railway.

(c) Effect on future vehicular traffic and revenues of a possible improved transbay rapid transit line placed into operation to implement the forthcoming recommendations of the Bay Area Rapid Transit Commission.

(d) Retirement of existing Bay Bridge indebtedness, including outstanding bonds and amounts to be repaid into the State Highway Fund.

Plans For Continuation of Financial Studies

Independent, qualified financial experts and traffic engineers having the confidence of and acceptable to bond houses and other underwriting agencies will be employed to study the various problems related to financing the Southern Crossing, and which are indicated briefly in the following listing:

(a) Diverted traffic from the Bay Bridge to the Southern Crossing.

(b) Induced or stimulated traffic on each of the bridges.

(c) Estimated future traffic growth.

(d) Total estimated future traffic on each of the crossings.

(e) Estimated costs of maintenance and operation.

(f) Cost and availability of insurance.

(g) Total necessary amount of bond issue required for construction and right of way costs, repayment of maintenance and operation costs, payments of interest during construction, retirement of existing Bay Bridge indebtedness, and possible financing of other incidental work.

(h) Bonding capacity, including probable rate of interest, most favorable term of bonds, etc.

(i) Amortization tables showing rates of toll necessary to pay maintenance, operation, and insurance costs, to cover interest charges, and to retire the indebtedness within different periods of time.

The detailed report to be completed by the Division in December 1955 will incorporate the findings of the financial and traffic consultants, and in addition will include data showing the total estimated cost of the Southern Crossing, and a breakdown showing the cost of each of the different elements of the Crossing and its approaches.

PART VIII

LEGAL

The Division of Contracts and Rights of Way of the Department of Public Works is now engaged in a detailed examination of all State and Federal Statutes which relate to the Southern Crossing. On the basis of this study information can be developed as to the advisability of enacting amending legislation to clarify any points about which doubt may exist or which conflict with previously enacted law. No final determination has been made as of the date of this report as to what amending legislation, if any, may be required.

STATE LEGISLATION

The California Toll Bridge Authority was created by the California Toll Bridge Authority Act enacted by Statutes of 1929, Chapter 763. The Act is the basic authority for State ownership and operation of toll bridges and other toll highway crossings, and for the financing of their capital cost. This Act, as amended, constituted the legal authority for the construction of the San Francisco-Oakland Bay Bridge and the Richmond-San Rafael Bridge, and for the acquisition of the Carquinez, Antioch, Dumbarton, and San Mateo-Hayward Bridges. It is now codified as Division 17 of the Streets and Highways Code.

The so-called "Southern Crossing Bill" was passed and approved during the 1953 Session of the Legislature. This Act, officially designated as Chapter 1056 of the Statutes of 1953, constituted a series of amendments and additions to the Toll Bridge Authority Act. It is under the provisions of this Act that the present work on the Southern Crossing is now being undertaken.

Chapter 1, The California Toll Bridge Authority Act, is briefly outlined as follows:

Article 1. General provisions. Includes definitions, statement of policy, etc.

Article 2. Organization of the California Toll Bridge Authority, employees, and legal counsel.

Article 3. General powers and duties of the California Toll Bridge Authority. Acquisition and construction of bridges, fixing of toll charges, determining conditions of use of crossing, power to issue permits and enter into contracts, provision for operation of facilities, and other powers.

Article 4. General powers and duties of Department of Public Works, acting as agent for the Toll Bridge Authority.

Article 5. Procedure for issuing bonds to finance a project. Estimates of cost required, bond resolution, pledging of revenues, forms of bonds, signatures required, sale price, and other technical matters related to form of bonds.

Article 6. Custody and use of money derived from sale of revenue bonds and from revenues received.

Article 7. Protection against competing facilities. Sect. 30350, prohibition against competing crossings within ten miles. Sect. 30351 and Sect. 30352, prohibitions relating to ferries. Sect. 30353, application of article to governmental and private agencies. Sect. 30354-30357, bridges and ferries excepted -- Golden Gate Bridge, bridges or tubes between Alameda and Oakland, ferry or bridge between Marin and Contra Costa Counties, ferry between Alameda and San Francisco, additional bridge financed from single authorization of bonds.

Article 8. Acquisition and disposition of property. Power of eminent domain, condemnation proceedings, superior rights in acquisition of property dedicated to public use, exchange of property, payment of franchise taxes, right of way over State lands, compensation for property, etc.

Article 9. Insurance of property.

Article 10. Cooperation from local agencies.

Chapter 2 of Division 17 relates to particular highway crossings as follows:

Article 1. San Francisco-Oakland Bay Bridge. Insurance required on toll bridge and structures on approaches. Structure shall comply with orders of federal agencies. Costs of maintenance and operation to be paid from tolls. Repayment to State Highway fund of previous amounts spent for maintenance and operation. (See Appendix A.)

Article 2. Southern Bay Crossing. This article was added to Chapter 2, Division 17, Streets and Highways Code, by Chapter 1056, Statutes 1953. The article consists of Sections 30651 to 30658, inclusive, all of which are printed in full in Appendix A of this report.

Chapter 3 of Division 17 is entitled "Toll Bridges, Toll Roads, and Toll Ferries Generally." It is applicable only to toll facilities operated by private agencies.

Relationship of Southern Crossing to Bay Bridge Plans

Key System has publicly announced its intention to request permission to substitute bus for rail service on the Bay Bridge within one or two years. This action, if approved by the State Public Utilities Commission, will result in a strong demand from the motoring public that the space on the Bay Bridge occupied by the rails be converted for vehicular use. As an alternative the possibility of operation of rail service by a public agency may be considered.

As is discussed in more detail in a report of the Division of Highways dated October 1954, either of these alternatives would probably necessitate a bond issue, to be supported by Bay Bridge tolls, of from $12,000,000 to $30,000,000.

However, the amendments to the Toll Bridge Authority Act enacted by Chapter 1056, Statutes of 1953, would appear to prohibit refinancing of the Bay Bridge for any purpose other than for the Southern Crossing. Therefore, if it is desired to make beneficial use of the space on the Bridge now occupied by the rails, some amending legislation to permit financing may be necessary.

Ten Mile Limitation

Article 7, Section 30350, of the California Toll Bridge Authority Act explicitly prohibits the construction of any new highway crossing within ten miles of any existing structure on which toll revenue bonds are still outstanding.

The San Mateo-Hayward Bridge was acquired by the State in September 1951, and is now covered by the provisions of Article 7. The easterly terminus of this bridge is approximately nine miles south of the location of the proposed Southern Crossing. However, the possibility of a Southern Crossing was foreseen at the time the San Mateo-Hayward Bridge was purchased, and the Bond Resolution was drafted so that the bondholders are afforded a guarantee only against competing crossings located within eight miles.

It has not as yet been determined whether the above mentioned ten mile limitation, which remains on the statute books, would have any effect on the financing or construction of the Southern Crossing.

Maintenance of Approaches

It does not appear that maintenance costs for the approaches to the Southern Crossing are to be paid from toll revenues. Section 30605 of the California Toll Bridge Authority Act specifies that "the cost of maintenance (exclusive of approaches) of the toll bridge and any additional highway crossing of San Francisco Bay..." shall be paid from tolls. Article 30651 defines the Southern Crossing as "an additional toll bridge or other highway crossing...across San Francisco Bay...and including the approaches thereto." Section 30204.5 states that if the existing bridge is a State highway, the additional bridge shall be a State highway of the same class. Section 30004 states that a "Toll Bridge" includes, among other things, "the approaches to each end thereof...".

In view of the foregoing, it appears the approaches to the Southern Crossing would become State highways, and State Highway funds, therefore, must be used for maintenance.

The East Bay approaches duplicate the general route of State Highway 226, which is defined in the Statutes as follows:

> Section 526. Route 226 is from: (a) A point in the vicinity of Davis Street and East Fourteenth Street in San Leandro, thence via Davis Street through the City of San Leandro and through the City of Oakland via Bayshore Boulevard and Doolittle Drive, thence through the City of Alameda via Webster Street and Posey Tube and any other tube or crossing to be used in connection with Posey Tube, to Route 69 in Oakland near Seventh and Harrison Streets. (b) Route 69 near Seventh and Harrison Streets in Oakland to Route 5.

It is considered advisable that the legal definition of Route 226 be changed to coincide with portions of the East

Bay approach system of the Southern Crossing before the latter is opened to traffic. If this is done, it would give added assurance of the availability of State Highway Funds for maintenance of the East Bay approaches. Moreover, revision of the definition would eliminate the possibility of having two parallel State-supported highways, namely Doolittle Drive and the San Leandro Bay Freeway, serving the same general area.

Harbors and Navigation Code

The Harbors and Navigation Code, as its name implies, is a body of California State law pertaining to the control of and navigation on the rivers and harbors of this State. Divisions I and VI of this Code are of particular interest to the Southern Crossing, since they relate to lands or waters traversed by the Southern Crossing or the approaches thereto. A brief review of the portions of each of the various Sections considered to be pertinent to the instant problem follows. More complete extracts of these Sections will be found in Appendix C of this Report.

Division I - Navigable Waters

Section 101, Channel Street (China Basin) in San Francisco is defined as navigable water and a public way from the Bay to the northeasterly line of Seventh Street, the width thereof to be 140 feet.

Section 105, San Leandro Bay, the San Antonio (Oakland) Estuary, and the airport channel are navigable and public ways.

Division VI - Part I, San Francisco Harbor

Section 1770, grants jurisdiction to the Board of State Harbor Commissioners for San Francisco Harbor for that portion of the Bay of San Francisco and the adjacent territory which is bounded by a designated line along the San Francisco waterfront, specifically embracing Channel Street and China Basin, with the outer boundaries along the southerly, easterly, and northerly lines of the City and County of San Francisco.

Section 1772, grants additional powers to the Board, and gives it possession, management, and control of all waterfront property outside the Pueblo of San Francisco.

Section 1781, China Basin and Channel Street, among other waterways, are designated as being under the jurisdiction of the Board of State Harbor Commissioners. Drawbridges may be required for the free and easy entrance and exit of vessels.

Section 1787, enactment of Code subsequent ot California Toll Bridge Authority Act does not alter powers of Board of State Harbor Commissioners, Toll Bridge Authority, or the Department of Public Works.

Section 2400 - 2404, provides for leases to accommodate "any transbay railroad, vehicular, passenger, or other bridge. . .". Lease not to exceed 50 years.

Section 3006, requires dredged material to be deposited in a place designated by the Board.

Section 3105, no obstruction to be placed in Bay or upon wharf or thoroughfare without consent of Board.

Section 3130 - 3131, Board has authority to lay out thoroughfare along waterfront, prescribes location and width thereof, and width of sidewalks.

Elsewhere in this discussion, under the heading of "Rights of Way", will be found an account of action taken to secure necessary rights of way from the Board of State Harbor Commissioners for San Francisco Harbor.

As stated in the section of this report which describes the San Francisco approaches, it is proposed to cross China Basin with a bridge providing a vertical clearance of 135 feet. On the Fourth Street Connection it is proposed to cross Channel Street (the extension of China Basin) with a fixed bridge providing a clearance of 35 feet.

As indicated above, Section 1781 of the Harbors and Navigation Code contains language relating to the construction of drawbridges across China Basin, Channel Street, and other waterways along the San Francisco waterfront. The specific legislative mandate in Chapter 1056, Statutes of 1953 (Streets and Highways Code, Section 30654), relative to the high-level bridge probably can be considered to amend the previous legislation insofar as it relates to China Basin. However, the Southern Crossing bill is silent on the matter of the clearance, if any, to be provided across Channel Street on the Fourth Street Connection.

It is not clear whether the proposed fixed bridge on the Fourth Street Connection would conflict with the language of the Statutes as contained in the Harbors and Navigation Code.

FEDERAL LEGISLATION

Public Law No. 695, 71st Congress, approved February 20, 1931, granted the consent of the Congress of the United States to the construction of the San Francisco-Oakland Bay Bridge. Section 2 of this law stated that the rates of toll, if charged, should be adjusted to provide a fund sufficient to pay the reasonable cost of maintaining, operating, and repairing the bridge and its approaches, and to provide a sinking fund to retire all indebtedness within a period of not to exceed forty years from the date of completion of the bridge.

The language of the act obviously prevented the use of Bay Bridge tolls to finance any other transbay crossing.

For this reason, after the Southern Crossing bill was passed by the State Legislature, legislation was introduced in the Congress to amend the Federal law to permit the use of Bay Bridge revenues for financing not to exceed two additional transbay crossings. This legislation, identified as Public Law 154, 83rd Congress, Chapter 248, 1st Session, was approved on July 27, 1953.

It has not been determined whether the passage of any additional Federal legislation will be required to allow the construction of the approaches to the Southern Crossing, particularly those approaches which cross lands owned by the United States.

RIGHTS-OF-WAY

The tide and submerged lands traversed by the Southern Crossing between the San Francisco waterfront and the Alameda-San Francisco County line are under the jurisdiction of the State Board of Harbor Commissioners for San Francisco Harbor. The tide and submerged lands traversed by the Southern Crossing in Alameda County between the tide lot line and the San Francisco-Alameda County line are under the jurisdiction of the City of Alameda.

Pertinent references to the Statutes are as follows:

Grants to Board of State Harbor Commissioners for San Francisco Harbor

Section 1770, Harbors and Navigation Code, Amended 1951, Chapter 1118.

Grants to City and County of San Francisco

Statutes of 1851, Chapter 41
Statutes of 1931, Chapter 627
Statutes of 1933, Chapter 912
Statutes of 1935, Chapter 162

Grants to City of Alameda

Statutes of 1913, Chapter 348
Statutes of 1917, Chapter 594
Statutes of 1927, Chapter 538

Rights-of-Way - San Francisco City and County

On the basis of language contained in the Harbors and Navigation Code (see Appendix C), it appears appropriate rights-of-way must be obtained from the State Board of Harbor Commissioners for San Francisco Harbor for all portions of the Southern Crossing and its approaches situated within boundaries of territory under the jurisdiction of the Commissioners.

This Division in a letter dated September 16, 1954, requested from the Board of Harbor Commissioners a 1,000-foot right-of-way along the line of the crossing from the line of State jurisdiction (roughly the San Francisco waterfront) to the San Francisco-Alameda County line. The Chief Engineer of the Port replied on behalf of the Commission in a letter dated October 1. He stated that a right-of-way 1,000 feet wide would be reserved for State Highway purposes east of the east boundary of the navigable channel, but (quoting from the Chief Engineer's letter) "for the remaining portion. . . which is located west of the east boundary of the navigable channel, the Board does not desire to release control of this area as future plans for its development are vested in the Harbor Board and it is considered vital that this control be maintained by the Board."

A permit involving a lesser width of right-of-way to cross the remainder of the channel will be granted, according to the letter, which stated, "The Board is willing, however, to grant you permission to construct and operate the proposed bridge. . . and for such area as is required for construction purposes during the period of construction." In a subsequent letter dated October 20, 1954, the Chief Engineer stated that the above described right-of-way would be reserved and ". . . that no use would be made thereof inconsistent with the purposes for which said lands are to be used by the Department of Public Works." Drawings showing the lands involved and containing a statement of intention as indicated above were signed by the Board of State Harbor Commissioners on November 10, 1954.

It has not been determined whether the right-of-way will be in fee rather than in some lesser interest in land, such as easements or permits.

Rights-of-Way - Alameda County

The privately-owned tidelands lying offshore from Bay Farm Island are now being acquired by the process of condemnation, by the Port of Oakland to protect its planned airport expansion program and to serve as a source of borrow material. The Board of Port Commissioners of the Port of Oakland has agreed to grant to the State a 1,000-foot right-of-way for the Southern Crossing over these submerged lands, and has also agreed to refrain from dredging in the area where the mole fill will be located.

The City of Alameda has reserved for highway purposes a 1,000-foot right-of-way from the San Francisco-Alameda County line to the tide lot line offshore from Bay Farm Island. The City has also agreed to reserve for State Highway purposes a basic 200-foot right-of-way for the Southshore Freeway, immediately adjacent to the southern boundary of the tide lot line.

Matters relating to the acquisition of other lands owned by Federal and local public agencies on the East Bay approaches have been referred to in a previous section of this report, but no legal action of any kind has as yet been initiated to acquire rights-of-way across these publicly owned areas. The most important parcels involved are (1) a portion of the Alameda golf course, (2) an area north of Doolittle Drive and within the Alameda City Limits, owned by the City of Alameda, (3) land owned by the U. S. Maritime Commission and located at the foot of Webster Street in Alameda, (4) the parcel along the extension of Main Street in Alameda, owned by the U. S. Naval Air Station, (5) parcels occupied by housing developments along Atlantic Avenue in Alameda, and (6) land along the shore of San Leandro Bay, owned by the Port of Oakland.

APPENDIX A

STREETS AND HIGHWAYS CODE

(Amendments and additions enacted by "Southern Crossing Bill," Chapter 1056, Statutes 1953)

Division 1. State Highways

Chapter 1. Administration

Article 3. The Department of Public Works

100.7. The department may, for the protection of the State of California, insure any bridge on the State Highway System acquired or constructed under provisions of the California Toll Bridge Authority Act against all risks in any amount up to the full insurable value thereof. In case of damage or destruction, the proceeds of such insurance shall be applied to the restoration of such bridge. Any such bridge may be so insured irrespective of the retirement of all indebtedness incurred for its acquisition or construction, and the cost of such insurance shall be paid from any funds available to the department for highway purposes.

Any such bridge, other than bridges over the San Francisco Bay, shall, after retirement of all indebtedness incurred for its acquisition or construction, be maintained and operated as a free bridge and the cost thereof charged to funds available for maintenance of state highways.

(Amended by Chapter 1056, Statutes 1953.)

Division 17. Toll Bridges, Toll Ferries, and Toll Roads

Chapter 2. Particular Highway Crossings

Article 1. San Francisco-Oakland Bay Bridge

30605. (a) The cost of operation and insurance of the toll bridge and any additional highway crossing of San Francisco Bay constructed between the County of Alameda and the City and County of San Francisco shall be paid by the department from the tolls and revenues received from the use and operation of the toll bridge and additional highway crossing. The cost of operation and insurance of any toll bridge or other highway crossing upon which tolls are now being collected or that may hereafter be acquired or constructed over the San Francisco Bay shall be paid by the department from the tolls and revenues received from the use and operation thereof.

(b) The cost of maintenance (exclusive of the approaches) of the toll bridge and any additional highway crossing of San Francisco Bay constructed between the County of Alameda and the City and County of San Francisco shall be paid by the department from the tolls and revenues received from the use and operation of the toll bridge and additional highway crossing, and the cost of maintenance (exclusive of the approaches) of any toll bridge or other highway crossing on which tolls are now being collected or that may hereafter be acquired or constructed over the San Francisco Bay, shall be paid by the department from the tolls and revenues received from the use and operation thereof, except as follows:

If the terms and conditions of any bonds that are outstanding on the effective date of this section and that are payable from such tolls are such as to require that the cost of physical maintenance of the toll bridge shall be paid from sources other than tolls and revenues from the use and operation of the toll bridge, the cost of such maintenance shall be paid by the department from money accruing and to accrue in the State Highway Fund available for the widening, resurfacing, and reconstruction of state highways for the group of counties designated as Group No. 1 in Section 187 until such bonds are refunded or retired or until payment of the cost of maintenance out of tolls and revenues from the toll bridge is authorized in the manner provided in the proceedings authorizing the issuance of such bonds. The State Highway Fund shall be reimbursed by the authority for all amounts so expended with interest thereon at the rate of one and one-half percent (1-1/2%) per annum to be computed on the total amount expended during any one year.

Whenever after the effective date of this section any bonds secured by pledge of the tolls and revenues of the toll bridge are refunded or retired, in the total then outstanding, the authority shall include in the proceedings for any new issue of bonds for such purpose bonds in a sufficient amount to repay to the State Highway Fund the amount provided by this section. If the amount is not repaid from the proceeds from the sale of bonds and all revenue bonds secured by revenues on the toll bridge are fully retired, and all other obligations secured by revenues of the toll bridge, whether by means of bond issue or other provisions of law have been fully paid, then such repayment shall be made from the tolls and revenues of the toll bridge, and the authority and the department shall fix and collect tolls on the toll bridge at a rate sufficient to include provision for such repayment until the amount required to be paid into the State Highway Fund by this section has been paid thereto.

The moneys required to be repaid by this section shall be credited to the money available for construction of state highways in County Group No. 1 as specified in Section 187.

(Repealed and added by Chapter 1056, Statutes 1953.)

30606. (Repealed by Chapter 1056, Statutes 1953.)

30607. There shall be repaid into the State Highway Fund the total amount expended therefrom prior to the effective date of this section for maintenance, operation, and insurance of the toll bridge, which amount shall be determined by the department and the authority.

Whenever, after the effective date of this section, any bonds secured by a pledge of the tolls and revenues of the toll bridge are refunded or retired, in the total then outstanding, the California Toll Bridge Authority shall include in the proceedings for any new issue of bonds for such purpose bonds in an amount fully sufficient to repay to the State Highway Fund the amount provided by this section.

If the amount provided to be repaid to the State Highway Fund by this section is not repaid from the proceeds of the sale of bonds, then, after all revenue bonds issued and sold by the California Toll Bridge Authority in the sum of twenty-one million dollars ($21,000,000) and designated as "San Francisco-Oakland Bay Bridge 1951 Refunding and Improvement Toll Bridge Revenue Bonds, Series A" have been fully redeemed and paid, the authority and the department shall fix and collect tolls on the toll bridge at a rate sufficient to include provision for such repayment until the amount required to be paid into the State Highway Fund by this section has been collected to make such payment.

The moneys required to be repaid by this section shall be credited to the money available for construction of state highways in County Group No. 1 as specified in Section 187.

(Repealed and added by Chapter 1056, Statutes 1953.)

30608. (Repealed by Chapter 1056, Statutes 1953.)

Article 2. Southern Bay Crossing

(Article 2 added to Chapter 2, Division 17, Streets and Highways Code, by Chapter 1056, Statutes 1953.)

30651. (a) As used in this article, "toll bridge" means that certain bridge across San Francisco Bay known as the San Francisco-Oakland Bay Bridge and the approaches thereto.

(b) As used in this article, "southern crossing" means an additional toll bridge or other highway crossing, as provided by this article and by Chapter 1 of this division, across San Francisco Bay from the City and County of San Francisco to the County of Alameda, and including the approaches thereto.

30652. As soon after the effective date of this section as it may lawfully do so under federal law, the California Toll Bridge Authority shall issue bonds in a sufficient amount to pay or provide for the payment of engineering studies, plans, and specifications of an additional bridge or other highway crossing across San Francisco Bay to relieve congestion of traffic on the toll bridge and to reimburse the State for such engineering expenses as have theretofore been incurred by it for that purpose, which additional bridge or other highway crossing is designated the southern crossing. From the proceeds of the sale of such bonds there shall be made available to the department the sum of one million five hundred thousand dollars ($1,500,000), or so much thereof as may be necessary, for the purpose of bringing the surveys and plans for the southern crossing to the same state of completion as those heretofore made for a northern crossing or crossing parallel to the San Francisco-Oakland Bay Bridge.

30653. (a) The authority and the department shall apply promptly to the appropriate officials of the Federal Government for permission to construct a southern crossing having its westerly terminus in the vicinity of Army and Third Streets in the City and County of San Francisco and its easterly terminus on Bay Farm Island, and shall obtain the necessary permits therefor as promptly as feasible.

(b) If permission to construct the southern crossing at the location specified in subdivision (a) of this section cannot be obtained, the authority and the department shall forthwith determine the most feasible location of the southern crossing and type of construction thereof, located southerly from the toll bridge and having its westerly terminus between the southern city limits and Army Street in the City and County of San Francisco and its easterly terminus on Bay Farm Island, and shall promptly confer with the appropriate officials of the Federal Government from whom permits must be obtained for the construction of such bridge or other highway crossing and shall obtain such permits as promptly as feasible.

30654. If the westerly terminus of the southern crossing is in the vicinity of Third and Army Streets, then the westerly approaches shall include:

(a) A freeway connection with Bayshore Freeway in the vicinity of 26th Street, with on-and-off ramps in both directions on Bayshore Freeway, together with connections to city streets in that location, and

(b) A freeway connection between Army Street and the Embarcadero Freeway in the vicinity of Mission Street with connections to city streets at Army Street, 23d Street, 19th Street, Main and Harrison Streets, Spear and Harrison Streets, Howard and Mission Streets on the Embarcadero, Fourth and Brannon Streets, and a high level bridge 135 feet above China Basin.

If the easterly terminus of the southern crossing is on Bay Farm Island at or in the vicinity of a point on the southwesterly shore thereof south of the intersection of Kilkenny Road and the county road connecting Bay Farm Island with the City of Alameda, the easterly approaches shall include:

(a) A freeway crossing Bay Farm Island to the bridge connecting the island with the City of Alameda, with on-and-off ramps in both directions, connecting with Kilkenny Road and the county road extending southeasterly, and also with the highway along the northerly shore of Bay Farm Island.

(b) A freeway from a point on the Bay Farm Island Freeway to a point on the Eastshore Freeway, to be constructed southeasterly from the City of Alameda.

(c) A freeway along the southerly shore of the City of Alameda from Bay Farm Island Bridge to a southerly prolongation of Main Street, thence northerly along Main Street to a point near Atlantic Avenue, and thence to the Posey Tube connecting the City of Alameda and the City of Oakland and a parallel tube which shall be constructed as part of the approaches, with on-and-off ramps connecting the freeway with the southerly end of Webster Street in the City of Alameda, and with adequate on-and-off ramps connecting the freeway and tubes with the streets in the Cities of Oakland and Alameda.

The tube parallel to the Posey Tube connecting the City of Alameda with the City of Oakland at Webster Street, and the approaches to the parallel tubes shall be constructed immediately as soon as money is obtained that may be used therefor either through the sale of revenue bonds the proceeds of which may be used for such purpose or through the refinancing by the Reconstruction Finance Corporation or any other agency.

30655. If the terminal points of the southern crossing differ substantially from those set forth in Section 30654, the authority and the department shall promptly determine appropriate approaches thereto as soon as its location and type of construction are determined to provide suitable connection with Bayshore Freeway and if necessary the construction of portions of such freeway and other connections to the main arterial routes in the City and County of San Francisco. It shall likewise determine appropriate approaches in Alameda County, including connections with the easterly terminus of such bridge or other crossing with the Eastshore Freeway at one or more points, and including an additional tube connecting the City of Alameda and the City of Oakland under the Oakland Estuary with suitable connections on each end of said tube. In connection with the location of the approaches to the bridge or other highway crossing to be constructed, the authority shall advise the governing bodies of the City and County of San Francisco, the County of Alameda, and all of the cities in the County of Alameda, as to the approaches it deems appropriate, and upon the request of any such governmental agencies shall hold public hearings concerning the location of said approaches before they are finally determined by the authority.

30656. As soon as surveys, plans, specifications and estimates of cost are completed for the southern crossing and the approaches thereto and the project has qualified for immediate construction under any governmental restrictions then in effect, the authority shall undertake the financing and construction of the southern crossing and the approaches as promptly as possible and without unnecessary delay, except that no construction shall be commenced unless and until all restrictions in the federal law imposing limitations upon the right of the State of California or the authority to collect tolls upon the existing San Francisco-Oakland Bay Bridge for the purpose of constructing a southern crossing of San Francisco Bay, or approaches leading to such crossing, have been deleted. The construction of the southern crossing, however, shall precede construction of any other such crossing.

It is hereby declared to be the intent of the Legislature that the construction of the southern crossing shall be commenced as soon as the federal law is amended so as to permit the collection of tolls upon the existing Bay Bridge for the purpose of constructing a southern crossing; but that this section is not intended to indicate a legislative declaration in favor of amending the federal law to permit collection of the existing bridge's tolls for construction of only one additional crossing, but rather that the Legislature favors amending the federal law to permit collection of such tolls for construction of other crossings in addition to the southern crossing.

30657. The authority, to the extent that it finds it feasible to do so in connection with the financing of the southern crossing and the approaches thereto, shall include sufficient funds in any borrowing or issuance of bonds therefor to provide such amounts as will be necessary for the construction of the approaches mentioned in Section 30654 on each side of San Francisco Bay.

30658. The authority shall consider the possibility of financing through a loan from the Reconstruction Finance Corporation as well as the issuance of bonds under Chapter 1 of this division and shall adopt a method of financing deemed most desirable from the standpoint of interest costs, restrictions that might be imposed by the Reconstruction Finance Corporation, or under any proposed bond indenture, to the end that the best facility designed to meet traffic needs will be constructed at the lowest possible cost. Such financing shall include the pledging of the revenues from the existing San Francisco-Oakland Bay Bridge as well as those of the southern crossing. The authority may exercise any power conferred under Chapter 1 of this division with reference to the borrowing of funds or the issuance of bonds to accomplish the improvements mentioned in this article, and may borrow funds or issue bonds to provide funds as needed to carry on the work.

A P P E N D I X B

U. S. ARMY INSTRUMENT OF APPROVAL

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER
SAN FRANCISCO DISTRICT
180 NEW MONTGOMERY
SAN FRANCISCO, CALIFORNIA

PEND Army Vern
Southern
Cl

s reply to
RICT ENGINEER
FRANCISCO DISTRICT
S OF ENGINEERS, U. S. ARMY
3050 RINCON ANNEX
FRANCISCO 19, CALIFORNIA

to File SPNKP 823 (S. F. Bay So Crossing)

26 April 1954

State of California
Department of Public Works
Sacramento, California

AMENTO
OFFICE
DEPT OF PUBLIC WORKS
1954 APR 27 AM 10 19

Gentlemen:

In compliance with your application dated December 31, 1953, there is inclosed an instrument of approval for the location and plans of a causeway-tube crossing of San Francisco Bay, from the vicinity of Army Street in San Francisco, to Bay Farm Island in Alameda, California.

Your attention is invited to the conditions under which this approval is granted, particularly conditions No. 3, 4, 10, 13, 14, 15, 16 and 17.

It should be understood that the approval granted by this instrument does not conclude that the Federal Government will grant approval for any extensions of this crossing or of any approach structures thereto, which may cross navigable waters. Any such structures must be the subject of separate applications and will be reviewed independently on the basis of the effect that they will have on navigation.

Very truly yours,

Geo H Walker
GEO. H. WALKER
Colonel, Corps of Engineers
District Engineer

1 Incl
Instrument of Approval

DEPARTMENT OF THE ARMY

INSTRUMENT

WHEREAS by Title V of an act of Congress approved August 2, 1946, entitled General Bridge Act of 1946 (Public Law 601-79th Congress) the consent of Congress was granted for the construction, maintenance, and operation of bridges and approaches thereto over the navigable waters of the United States;

AND WHEREAS section 502(b) of said act provides that: "The location and plans for such bridges shall be approved by the Chief of Engineers and the Secretary of the Army before construction is commenced, and, in approving the location and plans of any bridge, they may impose any specific conditions relating to the maintenance and operation of the structure which they may deem necessary in the interest of public navigation, and the conditions so imposed shall have the force of law;"

AND WHEREAS by section 10 of an act of Congress approved March 3, 1899, entitled "An Act making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes," it is provided that it shall not be lawful to build or commence the building of any wharf, pier, dolphin, boom, weir, breakwater, bulkhead, jetty, or other structures in any port, roadstead, haven, harbor, canal, navigable river, or other water of the United States, outside established harbor lines or where no harbor lines have been established, except on plans recommended by the Chief of Engineers and authorized by the Secretary of the Army; and it shall not be lawful to excavate or fill, or in any manner to alter or modify the course, location, condition, or capacity of any port, roadstead, haven, harbor, canal, lake, harbor of refuge, or enclosure within the limits of any breakwater, or of the channel of any navigable water of the United States, unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army prior to beginning the same (30 Stat. 1151; 33 U.S.C. 403);

AND WHEREAS the DEPARTMENT OF PUBLIC WORKS, STATE OF CALIFORNIA has submitted plans and a map of the location of a causeway-tube to be constructed across San Francisco Bay from Army Street, San Francisco to Bay Farm Island, Alameda in the State of California, which plans and map of location are hereto attached;

NOW THEREFORE, This is to certify that the location and attached plans of said causeway-tube are hereby approved by the Chief of Engineers and by the Secretary of the Army, pursuant to the above-mentioned acts of Congress, subject to the following conditions:

1. The district engineer in charge of the locality within which the causeway-tube is to be built may supervise its construction in order that said plans shall be complied with.

2. All work shall be so conducted so that the free navigation of the waterway shall not be unreasonably interfered with and the present navigable depths shall not be impaired. The channel or channels through the structure shall be promptly cleared of all falsework, piling, or other obstructions placed therein or caused by the construction of the causeway-tube, to the satisfaction of the said district engineer, when in his judgment the construction work has reached a point where such action should be taken, and in any case not later than ninety days after the causeway-tube has been opened to traffic.

3. The approval hereby granted shall cease and be null and void unless the actual construction of the causeway-tube be commenced within 5 years and completed within 10 years from the date of this instrument.

4. No deviation from the approved plans shall be made either before or after completion of the structure unless the modification of said plans has previously been submitted to and received the approval of the Chief of Engineers and of the Secretary of the Army.

5. Any material dredged in the prosecution of the work herein authorized shall be removed evenly, and no large refuse piles, ridges across the bed of the waterway or deep holes that may have a tendency to cause injury to navigable channels or to the banks of the waterway shall be left. Any material to be deposited or dumped under this authorization; either in the waterway or on shore above high-water mark, shall be deposited or dumped at the locality shown on the drawing hereto attached, and, if so prescribed thereon, within or behind a good and substantial bulkhead or bulkheads, such as will prevent escape of the material into the waterway.

6. If inspection or any other operations by the United States are necessary in the interests of navigation, all expenses connected therewith shall be borne by the grantee.

7. No attempt shall be made by the grantee or the owner to forbid the full and free use by the public of all navigable waters at or adjacent to the work or structure.

8. If future operations by the United States require an alteration in the position of the structures or work herein authorized, or if, in the opinion of the Secretary of the Army, it shall cause unreasonable obstruction to the free navigation of said water, the owner will be required, upon due notice from the Secretary of the Army, to remove or alter the structural work or obstructions caused thereby without expense to the United States, so as to render navigation reasonably free, easy, and unobstructed; and if, upon the expiration or revocation of this instrument,

the structures, fill, excavation, or other modification of the watercourse hereby authorized shall not be completed, the owner shall, without expense to the United States, and to such extent and in such time and manner as the Secretary of the Army may require, remove all or any portion of the uncompleted structure or fill and restore to its former condition the navigable capacity of the watercourse. No claim shall be made against the United States on account of any such removal or alteration.

9. The United States shall in no case be liable for any damage or injury to the structures or work herein authorized which may be caused by or result from future operations undertaken by the Government for the conservation or improvement of navigation, or for other purposes, and no claim or right to compensation shall accrue from any such damage.

10. The grantee shall notify the said district engineer at what time the work will be commenced, and as far in advance of the time of commencement as the said district engineer may specify, and shall also notify him promptly, in writing, of the commencement of work, suspension of work if for a period of more than one week, resumption of work, and its completion.

11. If, during the progress of the work, any plant, machinery, appliances or material are sunk, lost or thrown overboard, that in the opinion of the district engineer may be dangerous to or obstruct navigation, the grantee shall remove the same with the utmost dispatch. The grantee shall give immediate notice with description and location of such obstructions to the district engineer, and when so required by the district engineer shall mark or buoy such obstructions until the same are removed.

12. Whenever operations that will obstruct any part of the navigable channel are to be undertaken and approval of the district engineer therefor has been obtained, the grantee shall, at its own expense, cause navigation interests to be notified in advance of the proposed obstruction by publication in at least two prominent local daily papers and in "Notice to Mariners" of the U. S. Coast Guard, as well as by circular letter to all persons, companies, or corporations owning or operating plant in the waterway to the satisfaction of the district engineer. If the work of construction is prosecuted intermittently, the notices herein required shall be given in each instance, allowing a reasonable time, but not less than five days in advance of the proposed work.

13. Such lights, signals, and other aids to navigation in addition to those prescribed by law, as may be required by the Chief of Engineers and approved by the United States Coast Guard for the safety of navigation shall be installed and maintained by and at the expense of the owners of the crossing both during and after construction.

14. Such dolphins, falsework, survey platforms, mooring buoys, etc., or any obstructions to navigation, that may be necessary in connection with construction of the crossing shall require the prior written approval of the district engineer.

15. Such initial dredging to a depth of thirty-five (35) feet below M.L.L.W. as, in the opinion of the district engineer, may be required south of the proposed bridge to provide a suitable navigation approach to Islais Creek Channel equivalent to that existing, shall be performed by and at the expense of the owners prior to commencement of construction of the crossing.

16. Such fenders as may be found necessary in the interest of navigation and ordered and approved by the Chief of Engineers, shall be constructed and maintained by and at the expense of the owners.

17. It is understood that the depth of fifty (50) feet (below M.L.L.W.) over the 1,500-foot channel section of the tunnel as shown on the attached plans is to the top of a 5-foot cover over the tunnel.

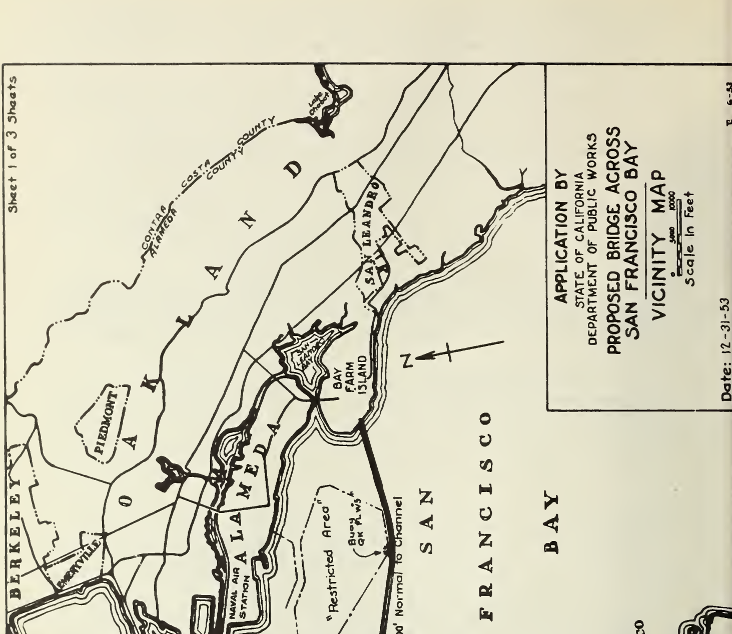
IN WITNESS WHEREOF I have hereunto set my hand by direction of the Chief of Engineers this—8th—day of—April—1954

E. C. Itschner

E. C. ITSCHNER
Brigadier General, USA
Assistant Chief of Engineers
for Civil Works

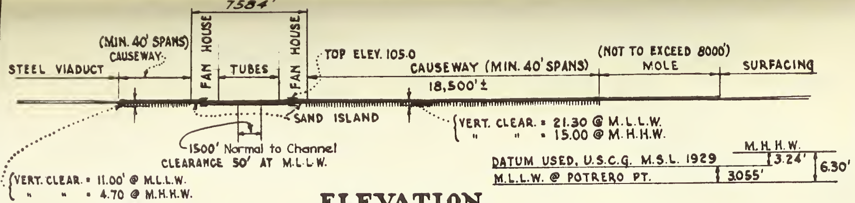
IN WITNESS WHEREOF I have hereunto set my hand by direction of the Under Secretary of the Army this— 9 —day of—April—1954

SHERRY B. MYERS
Lt. Col., JAGC
Chief, Legal Branch
OUSA

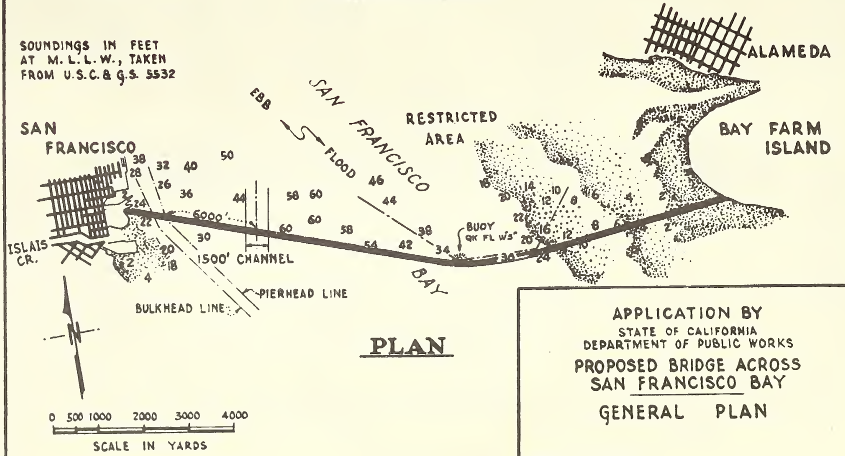

Sheet 1 of 3 Sheets
APPLICATION BY
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
PROPOSED BRIDGE ACROSS
SAN FRANCISCO BAY
VICINITY MAP
0 5000 10000
Scale In Feet
Date: 12-31-53
N
BERKELEY
EMERYVILLE
PIEDMONT
OAKLAND
CONTRA COSTA COUNTY
ALAMEDA COUNTY
Lake Chabot
SAN LEANDRO
SAN LEANDRO BAY
BAY FARM ISLAND
ALAMEDA
NAVAL AIR STATION
"Restricted Area"
Buoy GK Fl. W5
1500' Normal to Channel
SAN FRANCISCO BAY
Treasure Island
Angel Is.
SAN FRANCISCO
ARMY ST.
HUNTERS PT.
SAN FRANCISCO
SAN MATEO
DALY CITY
COLMA
SOUTH SAN FRANCISCO

Date: 12-31-53

SHEET 2 OF 3 SHEETS



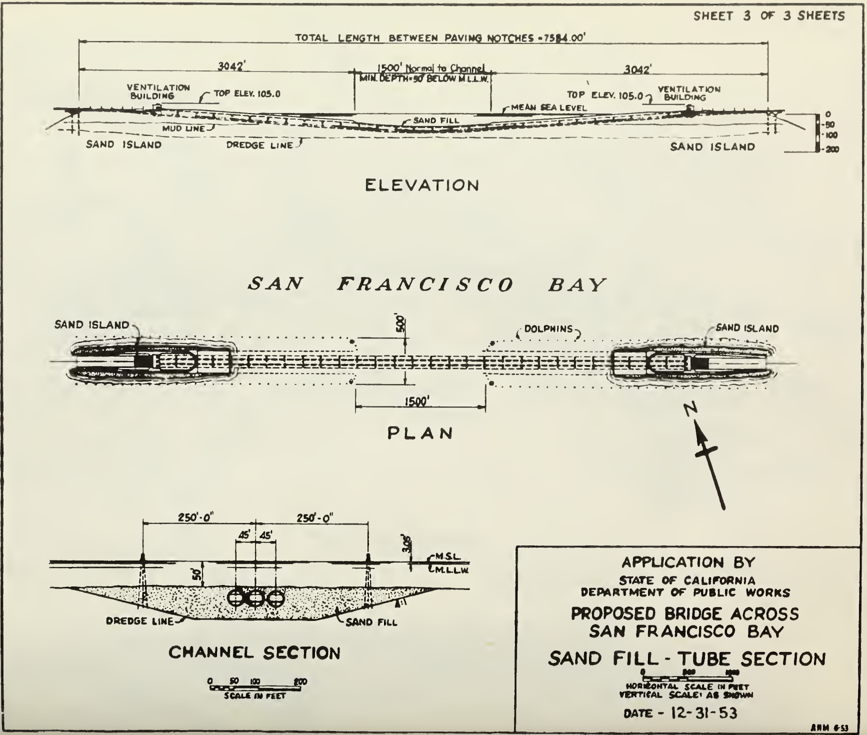
ELEVATION



PLAN

APPLICATION BY
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
PROPOSED BRIDGE ACROSS
SAN FRANCISCO BAY
GENERAL PLAN

DATE : 12-31-53



APPLICATION BY
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
PROPOSED BRIDGE ACROSS
SAN FRANCISCO BAY
SAND FILL - TUBE SECTION
0 500 1000
HORIZONTAL SCALE IN FEET
VERTICAL SCALE: AS SHOWN
DATE - 12-31-53

APPENDIX C

Extracts from Harbors and Navigation Code of the State of California (1953 Edition) pertinent to the Southern Crossing

Division I
NAVIGABLE WATERS

Section 101

Streams and water declared navigable and public ways. The following streams and waters are declared navigable and are public ways:

* * *

Channel Street, in the city of San Francisco, from the bay to the northeasterly line of Seventh Street, the width thereof to be one hundred forty feet.

* * *

Section 105

Same. The following streams and waters are also navigable and are public ways:

* * *

San Leandro Bay, in the county of Alameda, the waters included in the estuary of San Antonio and the tidal canal connecting it with San Leandro; and the airport channel extending from the bay.

* * *

Division VI
HARBORS AND PORTS
PART 1, SAN FRANCISCO HARBOR

Section 1770

Property in possession and control of board. Subject to any valid leases and subject to such jurisdiction as the City and County of San Francisco may have in the public streets within the area hereinafter described and subject to the present occupancy and use of land and air space by the San Francisco-Oakland Bay Bridge under the jurisdiction of the California Toll Bridge Authority and the Department of Public Works the board has possession and control of that portion of the Bay of San Francisco, and the adjacent territory, together with all the improvements, rights, privileges, easements, and appurtenances connected therewith, or in anywise appertaining thereto, for the purposes provided by this part, which is bounded as follows:

Commencing at the intersection of the center line of Lewis Street with the center line of Webster Street; running thence . . .

* * *

. . . thence easterly along the southerly line of Pacific Avenue to the westerly line of the Embarcadero; thence southerly along the westerly line of the Embarcadero to the northerly line of Howard Street; thence westerly along the northerly line of Howard Street to the westerly line of Steuart Street; thence southerly along the westerly line of Steuart Street to the westerly line of the Embarcadero; thence southerly along the westerly line of the Embarcadero to a point 137.5 feet southerly from the southerly line of Harrison Street measured at right angles thereto; thence westerly parallel to Harrison Street to the westerly line of Spear Street; thence southerly along the westerly line of Spear Street to the northerly line of Bryant Street; thence westerly along the northerly line of Bryant Street to the westerly line of Beale Street; thence southerly along the westerly line of Beale Street to the northerly line of Brannan Street; thence westerly along the northerly line of Brannan Street to the westerly line of First Street; thence southerly along the westerly line of First Street to the northerly line of Townsend Street; thence westerly along the northerly line of Townsend Street to the westerly line of Gale Street; thence southerly along the westerly line of Gale Street to the northerly line of King Street; thence westerly along the northerly line of King Street to the westerly line of Second Street;

Thence southerly along the westerly line of Second Street to the northerly line of Berry Street; thence westerly along the northerly line of Berry Street to the westerly line of Third Street; thence southerly along the westerly line of Third Street to the northerly line of Channel Street; thence westerly along the northerly line of Channel Street to the easterly line of Seventh Street; thence southerly along the easterly line of Seventh Street to the southerly line of Channel Street; thence easterly along the southerly line of Channel Street to the westerly line of Third Street; thence southerly along the westerly line of Third Street to the southwesterly line of Fourth Street; thence southeasterly along the southwesterly line of Fourth Street to the westerly line of Illinois Street; thence southerly along the westerly line of Illinois Street to a point on the line of ordinary high tide as established by the Board of Tideland Commissioners, between Butte, now

Nineteenth, Street and Napa, now Twentieth, Street in 1868; thence easterly, southerly and westerly along said high water mark to the westerly line of Illinois Street to the center line of Twenty-fifth Street; thence easterly along the center line of Twenty-fifth Street to the easterly line of Massachusetts Street; thence southerly along the easterly line of Massachusetts Street to the northerly line of Tulare Street; thence westerly along the northerly line of Tulare Street to the center of Texas Street; thence southerly along the center of Texas Street produced to the southerly line of Islais Street produced westerly. . . thence southerly along said last mentioned line to the southern boundary of the City and County of San Francisco; thence along the southerly, easterly and northerly boundary lines of said city and county to a point due north of the place of commencement; thence south to the place of commencement.

Section 1772

Additional powers granted to board.

(Powers, controls and possessions relating to properties of State.) The board has the powers, controls and possessions granted by this part relating to properties of the State of California mentioned in this part in addition to all powers, controls and possessions otherwise granted the board by the laws of the State of California.

(Possession, etc.,of property outside boundaries of pueblo.) The board has the possession, management and control of all property belonging to the State located within the city of San Francisco, but outside of the boundaries of the pueblo of San Francisco and which property is appurtenant to, or adjacent to, or constitutes a portion of the navigable waters of the bay of San Francisco, or any arm, channel, basin, inlet, or waterway constituting a part of or adjacent to, the bay of San Francisco, within the city of San Francisco.

Section 1781

Waters and property dedicated to public use: Construction of draw bridges. China, Central, South, India, and Dry Dock basins, as laid out by the Board of Tide Land Commissioners, and Channel Street, Islais Creek Channel, and the canal opening into South Basin, as far as the ebb and flow of tide in them, are dedicated to public use for the purposes of commerce and navigation, and are subject, together with the streets inclosing or bounding on them, and the sea wall and thoroughfare constructed across their openings, to the jurisdiction of the board. In case the sea wall or thoroughfare is extended across them, openings therein, with proper draw bridges, shall be constructed, of sufficient width to allow free and easy entrance and exit, and they shall be dredged to such depth as may be needed by the class of vessels using them.

Section 1787

Enactment of code subsequent to California Toll Bridge Authority Act: Construction. The fact that this code is enacted at a date subsequent to the enactment of the California Toll Bridge Authority Act, shall not be construed to alter, increase or diminish the respective rights, powers, duties, responsibilities and jurisdiction of the Board of State Harbor Commissioners for San Francisco Harbor, the California Toll Bridge Authority, or the Department of Public Works.

Section 2400

"Bridge terminal" and "approaches" defined. For the purposes of this article the words "bridge terminal" mean the end or resting point of any transbay railroad, vehicular, passenger or other bridge; the word "approaches" means any land or space upon land submerged or otherwise adjacent to, surrounding, or in front of the terminal of any bridge referred to in this article.

Section 2401

Lease of lands for terminals, etc.: Term. The board may lease any lands, or portions of lands, under its jurisdiction for the purpose of providing terminals for bridges, approaches thereto and lands necessary for the placement of bridge terminals and lands crossed over or to be crossed over by any bridge or built over in the preparation for and the placement of bridge terminals, for a term not exceeding fifty years.

Section 3006

Deposit of substance dredged. When any portion of the premises under the jurisdiction of the board is dredged, the sand, mud, or other substance shall be deposited in a place designated by the board.

Section 3105

Obstructions in bay or upon wharf or thoroughfare: Placing without board consent. A person shall not place, or cause to be placed, any obstructions in the portion of the bay of San Francisco described in this part, nor upon any wharf or thoroughfare, without the consent of the board.

Section 3130

Thoroughfare along water front: Authority to lay out and open: Uniform width: Inner line: Conformity of roadways and sidewalks. The board shall lay out and open along the water front line, a thoroughfare of the uniform width of two hundred feet, the inner line of which shall be parallel with the water front line, except that, its inner line between Market Street and Folsom Street shall correspond with the present line of East Street, and its inner line between Clay Street and Sacramento Street shall be a straight line drawn from the intersection of the north line of Clay Street, with the inner line of the thoroughfare to the intersection of the north line of Sacramento Street with the north line of Market Street extended, and its roadways and sidewalks shall conform to this deviation from its uniform width.

Section 3131

Same: Width of roadway and sidewalk: Construction and repair. The thoroughfare shall have a roadway of one hundred and eighty feet, and a sidewalk on its inner side of twenty feet in width. The roadway shall be constructed and kept in repair by the board. The sidewalk shall be constructed and kept in repair in the manner provided by law for the construction and repair of sidewalks on other streets of San Francisco.

APPENDIX D

SOURCES OF TRAFFIC DATA

The following is a list of some of the basic sources of traffic information available for use in the analysis of traffic:

1. "Report of Board of Engineers, Transbay Bridge, San Francisco," May 1927.
2. "Report of The Hoover-Young San Francisco Bay Bridge Commission," August 1930.
3. "Preliminary Studies for an Additional Bridge Across San Francisco Bay," California Department of Public Works, January 1947.
4. Data obtained by Bay Area Metropolitan Traffic Survey, in cooperation with U. S. Bureau of Public Roads, 1946 - 1947.
5. "Traffic Report, San Francisco Bay Metropolitan Area," and "Map Exhibits to Accompany Traffic Report," District IV, California Division of Highways, June 1949.
6. "Report on Estimated Traffic and Earnings of Existing and Additional San Francisco Bay Toll Crossing," Coverdale & Colpitts, November 1, 1948.
7. "A Report to Department of Public Works on Additional Toll Crossings of San Francisco as proposed by Consultants to Assembly Interim Committee," Division of San Francisco Bay Toll Crossings, October 1949.
8. "Report on the San Mateo-Hayward and Dumbarton Bridges," California Division of Highways, May 1950.
9. "A Report on Proposed Highway Toll Crossing, Richmond-San Rafael Bridge," Division of San Francisco Bay Toll Crossings, January 1951.
10. "Preliminary Report to the San Francisco Bay Area Rapid Transit Commission," DeLeuw, Cather & Company, December 1952.

11. Origin-destination data collected by Parsons, Brinckerhoff, Hall, and MacDonald as basic data to be used in the forthcoming report for the San Francisco Bay Area Rapid Transit Commission.

12. "Financial History of the San Francisco-Oakland Bay Bridge," A. Alan Post, Legislative Auditor, State of California, January 1953.

13. "Report on the Bridge Railway of the San Francisco-Oakland Bay Bridge," Coverdale & Colpitts, May 15, 1953.

14. "Report to California Toll Bridge Authority on the Bridge Railway Situation on the San Francisco-Oakland Bay Bridge," California Division of Highways, October 1954.

15. "Development Plan for the Metropolitan Oakland International Airport," Knappen-Tippetts-Abbett-McCarthy, July 1954.

16. Annual Traffic Counts, and Annual Reports, California Division of Highways.

17. Traffic Records, San Francisco-Oakland Bay Bridge, San Mateo-Hayward Bridge, and Dumbarton Bridge, California Division of Highways.

18. Traffic records, Golden Gate Bridge, Golden Gate Bridge and Highway District.

19. Estimates of traffic on Carquinez Bridge, District IV, Division of Highways, San Francisco.

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